## DOCUMENT RESUME

| | |
|---|---|
| ED 222 716 | CE 034 175 |
| TITLE | General Metal Trades Book I. Units of Instruction. Teacher's Guide. |
| INSTITUTION | East Texas State Univ., Commerce. Occupational Curriculum Lab. |
| SPONS AGENCY | Texas Education Agency, Austin. Dept. of Occupational Education and Technology. |
| PUB DATE | 82 |
| NOTE | 393p. |
| AVAILABLE FROM | Occupational Curriculum Laboratory. East Texas State University, Commerce, TX 75428. |
| PUB TYPE | Guides - Classroom Use - Guides (For Teachers) (052) |
| EDRS PRICE | MF01 Plus Postage. PC Not Available from EDRS. |
| DESCRIPTORS | Behavioral Objectives; Blueprints; Curriculum Guides; *Employment Interviews; Human Relations; Hygiene; Industrial Arts; Instructional Materials; Job Application; Leadership Training; Learning Activities; *Mathematics; *Measurement; Measurement Equipment; Metal Industry; *Metals; *Metal Working; Metric System; Safety; Secondary Education; Student Organizations; Teaching Guides; Tests; *Trade and Industrial Education; Transparencies; Youth Clubs; Youth Leaders |
| IDENTIFIERS | Vocational Opportunities Clubs of Texas |

ABSTRACT

This teacher's guide provides instructional materials for a 10-unit course in the General Metal Trades program. Each unit includes most or all of these basic components: performance objectives (unit and specific objectives), suggested teaching activities (a sheet outlining steps to follow to accomplish specific objectives), information sheets, transparency masters, job sheets, assignment sheets, answers to assignments, unit evaluations, and answers to evaluations. Topics covered in the units are an introduction to general metals, youth leadership, human relations in the shop, grooming and hygiene, job application and interview, general safety, metals and steel production, shop math, measuring and layout, and reading drawings and blueprints. (YLB)

***********************************************************************
*    Reproductions supplied by EDRS are the best that can be made    *
*                  from the original document.                       *
***********************************************************************

ED222716

# Units of Instruction

# GENERAL METAL TRADES

## Book I

## Teacher's Guide

CE 034 175

*Published by*
*Occupational Curriculum Laboratory*
*Secondary and Higher Education*
*East Texas State University*
*Commerce, Texas*

*in cooperation with*
*Texas Education Agency*
*Occupational Education and Technology*
*Austin, Texas*

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

- Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

D Bristow

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

**FIRST EDITION**
**1982**

*Brand names, company names, trademarks, or other identifying symbols appearing in the text are used to clarify and identify and do not constitute a recommendation or endorsement.*

*To insure educational equity, this material has been reviewed to eliminate bias or stereotyping.*

OCCUPATIONAL
CURRICULUM
LABORATORY

ETSU, an Equal Opportunity University, complies with all federal requirements prohibiting discriminatory activities.

## TABLE OF CONTENTS

Preface v

Acknowledgements vii

Use of Instructional Units ix

| UNIT NUMBER | UNIT TITLE |
|---|---|
| Unit I | INTRODUCTION TO GENERAL METALS |
| Unit II | YOUTH LEADERSHIP |
| Unit III | HUMAN RELATIONS IN THE SHOP |
| Unit IV | GROOMING AND HYGIENE |
| Unit V | JOB APPLICATION AND INTERVIEW |
| Unit VI | GENERAL SAFETY |
| Unit VII | METALS AND STEEL PRODUCTION |
| Unit VIII | SHOP MATH |
| Unit IX | MEASURING AND LAYOUT |
| Unit X | READING DRAWINGS AND BLUEPRINTS |

# PREFACE

GENERAL METAL TRADES BOOK I was prepared with the assistance of numerous instructors across the state in an attempt to provide adequate instructional materials for General Metal Trades programs in Texas. Since it is known that instructional content varies from program to program, these units were developed to provide students with a basic coverage of knowledges and skills for each area of instruction in the General Metal Trades program.

These materials, if properly presented, will provide a stimulus for student interest in pursuing training in one or more areas of instruction related to the occupational areas within the General Metal Trades cluster. Also, the information and skill training provided through the use of this guide will provide the students with the basic entry level skills to enter industry as a trained worker.

This guide, along with GENERAL METAL TRADES BOOK II and WELDING produced at the Occupational Curriculum Laboratory, should serve as an excellent basis for the General Metal Trades program course of study.

Durwin Hohhertz
Occupational Curriculum Laboratory

# ACKNOWLEDGMENTS

Appreciation is extended to the many individuals who contributed their time and talents to the development of these materials for General Metal Trades programs.

The contents of this publication were planned and reviewed by the following General Metal Trades instructors:

Richard Perez - El Paso

Ed Fasholtz - Lubbock

Ronnie Stanley - Longview

Ray Blohn - Dallas

Phillip Reed - Dallas

A special thanks to Ron McBride at West Texas State University in Canyon who assisted with research and technical content.

Gratitude is expressed to Frances Hyatt and staff for typesetting and editing of this publication.

Gratitude is also expressed to Bob Norsworthy and staff for the many illustrations and transparency masters provided for the publication.

Dale White and staff deserve much credit for the quality printing of this publication.

## USE OF THE INSTRUCTIONAL UNITS

These units cover certain instructional areas in the General Metal Trades program. Each unit includes most or all of the basic components of a unit of instruction: performance objectives, suggested teaching activities, information sheets, transparency masters, assignment sheets, job sheets, unit tests and answers to unit tests. Units are planned for more than one classroom period of instruction.

Careful study of each instructional unit will enable the teacher to determine:

A. The amount of material that can be covered in each class period

B. The skills that must be demonstrated

C. Supplies and equipment needed for skill performance

D. The amount of classroom time needed for teacher demonstration and student practice

E. Supplementary materials that must be ordered

F. Any resource personnel who must be contacted

The specific components of an instructional unit perform the following functions:

### OBJECTIVES

Each unit of instruction is based on performance objectives. These objectives specify the exact behaviors the student will be exhibiting, thus providing students with a sense of direction.

Performance objectives are stated in two forms. The unit objectives state the materials to be covered in the unit of instruction and how the student will handle the material. Specific objectives state the types of performance the student will be doing to satisfy the unit objective.

A classroom discussion should follow immediately after the students read the objectives so that any questions concerning the performances expected of the student can be answered.

### SUGGESTED TEACHING ACTIVITIES

Each unit of instruction has a suggested teaching activities sheet outlining steps to follow in accomplishing specific objectives.

Duties of the instructor will vary from unit to unit, but the following are minimum activities for the instructor:

1. Provide students with objectives, information, assignment, and/or job sheets

2. Discuss objectives and information sheets

3. Make transparencies

4. Demonstrate procedures outlined on job sheets (when included)

5. Give test

Many additional instructional activities and teaching methods are included to assist the instructor with classroom instruction and student motivation.

## INFORMATION SHEETS

Information sheets provide content essential for meeting the cognitive requirements of the unit. These sheets provide an excellent guide for presenting required explanations necessary to develop the skills specified in the unit objective.

Students should read the information sheets before the information is discussed in class. Students are encouraged to make any additional notes on the information sheets to help them in their learning process.

## TRANSPARENCY MASTERS

Transparency masters provide information in a special way. Transparencies may present new information or they may reinforce information presented in the information sheets. These are particularly effective when identification is necessary.

Make the transparencies from the masters and place them in your notebook ready for immediate use.

## JOB SHEETS

Job sheets are an integral part of each unit of instruction. The instructor should be able to demonstrate the skills outlined in the job sheets. Procedures specified in the job sheets give direction to the skill being taught, and allow both student and teacher to check student progress in performing the skill. Job sheets provide a ready outline to students and furnish to potential employers a picture of the types of skills being taught.

## ASSIGNMENT SHEETS

Assignment sheets give direction to study and furnish activities which provide application of the material contained in the information sheet. These may be given to the student for completion in class or used for homework assignments. Answer sheets are provided for checking student progress.

## ANSWERS TO ASSIGNMENTS

Assignment answers are provided for the instructor's convenience in each unit. These may be used by the teacher and/or student. Some assignments do not require specific answers, but depend upon student participation. These should be graded on an individual basis according to participation.

## UNIT EVALUATION

Questions in the Unit Evaluation have been constructed to measure student achievement of each specific objective listed on the objective sheet. Individual test items may be pulled out to be used as short test to determine student achievement of a particular objective. This kind of testing may be used as a daily quiz (oral or written) and will help the teacher spot difficulties being encountered by students in their efforts to accomplish the unit objective.

## ANSWERS TO EVALUATIONS

Answers are provided for each unit evaluation. These may be used by the teacher and/or student for checking student achievement of the objectives. The instructor should reinforce the correct answers when a question is missed.

## PERSONALIZING AND LOCALIZING INSTRUCTIONAL UNITS

Carefully review the instructional units before using them in the classroom. In reviewing the units, you will find it necessary to localize and personalize the material based upon the needs of your students. You will also find it necessary to organize the materials in the proper teaching sequence to follow your course outline and lesson plans.

Some of the ways of supplementing units include the use of audiovisuals, attention-getters, field trips, resource personnel, games and simulations, case studies, peer teaching, role-playing, and personal experiences of both the teacher and students.

Various methods may be used in localizing a unit of instruction. You may wish to apply units of instruction to the local community, add additional materials from newspapers and magazines, invite local resource people, and arrange for field trips.

In personalizing a unit of instruction, you may want to make the course content relevant to home and/or work situations. You may wish to involve students in the planning of the unit by using their own personal experiences. Having students involved in the teaching of some of the materials is sometimes an effective example of peer teaching.

Remember that as an instructor, you may wish to add any objectives to the units of instruction based on the individual needs of the student. If this procedure is followed, you must add the corresponding information in the information sheet, add any assignment or job sheets as deemed necessary, and construct a corresponding unit test item.

# UNIT I

## INTRODUCTION TO GENERAL METALS

### UNIT OBJECTIVE

After completing this unit, the student will be able to identify the terms, areas of instruction, policies and regulations, the Social Security program, and occupational information relating to the General Metals program. This knowledge will be evidenced through demonstration and by successfully completing the unit test.

### SPECIFIC OBJECTIVES

After completion of this unit, the student should be able to:

1. Match the introductory terms used in General Metals to the correct definition
2. Point out the areas of instruction involved in General Metals
3. Point out the semiskilled, skilled, and technical careers available in metal working
4. Explain the school policies and regulations to be followed
5. Select the correct clothing to be worn in the shop
6. Point out the correct general shop policies
7. Explain the Social Security system
8. Fill out an application for a Social Security number
9. Fill out an application for a duplicate card

# UNIT I

# INTRODUCTION TO GENERAL METALS

## SUGGESTED TEACHING ACTIVITIES

I. Objective sheet

   A. Discuss the unit objective with the students.

   B. Discuss each specific objective with the students.

   C. Have the students complete the objectives in the most logical sequence for shop organization.

   D. Add any objectives necessary.

II. Information and assignment sheets

   A. INFORMATION SHEET 1--OVERVIEW

      1. Explain the terminology to the students.

      2. Discuss the areas of instruction taught in your program.

      3. Tour your shop as you talk about the equipment and areas of instruction.

      4. Relate the career opportunities in the community to the students.

   B. INFORMATION SHEET 2--POLICIES AND REGULATIONS

      1. Discuss the policies and regulations in the school handbook with the students.

      2. Cover any special regulations and clothing required in General Metals.

      3. Have each student complete ASSIGNMENT SHEET 1--PERSONAL DATA SHEET for your file.

         a. Have a camera on hand or require each student to provide a picture to be attached to the sheet.

         b. Attach other information about the student to the sheet.

   C. INFORMATION SHEET 3--SOCIAL SECURITY

      1. Explain how the Social Security system applies to each student.

      2. Assist the students in securing a Social Security number or a duplicate card by using the following assignment sheets.

a. ASSIGNMENT SHEET 2--APPLICATION FOR SOCIAL SECURITY NUMBER

(NOTE: Have those students that have never applied for a number fill out this assignment sheet.)

b. ASSIGNMENT SHEET 3--APPLICATION FOR A DUPLICATE CARD

(NOTE: Have those students who have lost their card use this assignment.)

II. Transparency masters

(NOTE: Transparency masters are included in the student manuals and may be used as information sheets.)

A. TM-1--METAL WORKING OPERATIONS

B. TM-2--WELDING PROCESSES

C. TM-3--MACHINE SHOP EQUIPMENT

D. TM-4--SHEET METAL EQUIPMENT

E. TM-5--CAREERS IN METAL WORK

F. TM-6--APPLICATION FOR SOCIAL SECURITY NUMBER

IV. Evaluation

A. The unit test is divided into three parts.

(NOTE: Each part covers one information sheet.)

B. Various approaches may be used in testing:

1. Give each part of the test after the student has completed studying the information on one information sheet.
2. Give the entire test upon completion of all of the information sheets in the unit.
3. Give one or more parts of the test as an additional assignment or to reinforce problem areas of learning.

C. Include evaluation parts corresponding to any information area or sheets added to the unit.

V. Answers to the test

A. Answers are based on total information covered in the unit.

B. For convenience of grading, make corresponding answer sheets for any additional test parts included.

VI. References

A. A Suggested Basic Course Outline for General Metal Trades. Occupational Curriculum Laboratory, East Texas State University, Commerce, Texas

B. Machine Shop, Suggested Basic Course Outline. Vocational Instructional Services, Texas A&M University, Bryan, Texas

C. Local School Handbook

# UNIT I

## INTRODUCTION TO GENERAL METALS

### INFORMATION SHEET 1--OVERVIEW

I. Orientation Terms

- A. Assignment sheet--the activities which will help relate the information provided by the information sheets
- B. Attitude--the manner of acting, feeling, or thinking that shows a person's personality
- C. Career--kind or type of work that a person chooses as a way to earn money
- D. Credit--the certification of a student's completion of a unit of instruction or a course of study to the instructor's satisfaction.
- E. CVAE--coordinated vocational academic education
- F. Discipline--a system of rules governing conduct and activities
- G. Fabrication--the forming, shaping, and assembly of material to make a product
- H. FICA--The Federal Insurance Contributions Act
- I. Information sheet--provides the necessary information to complete the unit
- J. Job sheet--provides a list of items and procedures necessary to perform a skill
- K. Machine shop--a shop that uses power-driven tools to produce accurate and uniform parts that are assembled into thousands of useful items
- L. Metallurgy--the processing of metals as they are made into commercial products
- M. Objective sheet--states the types of performance the student will do to satisfactorily complete the unit
- N. Orientation--becoming familiar with classmates, shop policies and information, type of work involved, and responsibilities
- O. Sheet metal work--working with thin sheets of material to form, shape or joing the material into useful articles such as automobile parts, air conditioning duct work, roofing and siding, and kitchen equipment

P. Evaluation--a method of checking the students' understanding of the information in a unit

Q. Welding--a process by which two or more pieces of metal are joined into a single unit by heating them to a temperature high enough to cause them to melt and combine

II. Areas of instruction

A. Orientation to Metal Trades

1. Importance of being safety conscious

2. Importance of proper conduct

3. Proper use of tools (TM-1)

B. Basic metal work and fabrication

1. Filing

2. Drilling

3. Bending

4. Threading

5. Tool sharpening

6. Fastening

7. Assembly

C. Welding

1. Oxyacetylene

2. Spot

3. Arc

4. Mig

5. Tig

D. Machine shop

1. Drilling

2. Lathes

3. Mills

4. Shaper

5. Saws
6. Grinders
7. Metallurgy

E. Sheet metal

1. Cutting
2. Bending or forming
3. Pattern development
4. Seams
5. Fasteners

III. Careers in Metal Trades

A. Semiskilled

(NOTE: Requires a skill with some training.)

1. Machine helper
2. Production lathe operator
3. Drill press operator
4. Turret lathe operator
5. Milling machine operator
6. Metal fabricator
7. Welder's helper

B. Skilled

(NOTE: Requires apprentice training or advance study.)

1. Machinist
2. Tool and diemaker
3. Layout person
4. Set-up person
5. Supervisor

C. Technical

(NOTE: Usually requires at least two years of college.)

1. Engineering aide
2. Cost estimator
3. Machine programmer
4. Repairer

D. Nature of work

1. Inside and outside
2. Seasonal and non-seasonal
3. Unionized or independent operations
4. Health hazards

Examples: Sharp metal
Sparks
Hot metal

## UNIT I

## INTRODUCTION TO GENERAL METALS

### INFORMATION SHEET 2--POLICIES AND REGULATIONS

I. Types of policies

(NOTE: The student should become acquainted with the following policies through the instructor or principal.)

- A. Grading system
- B. Report card time periods
- C. Excused and unexcused absences
- D. Schedule changes
- E. Extended illnesses and doctors' statements
- F. "Make up" policy for school work missed
- G. Class attendance, hall passes, and tardy policies
- H. Suspension and expulsion
- I. Exemption program guidelines

II. Shop clothing

- A. No jewelry should be worn
- B. Loose fitting clothing should not be worn around machines
- C. Frayed or oily clothes should not be worn when welding
- D. Students should wear coveralls or other protective clothing
- E. Boots or other protective shoes should be worn when welding; never tennis shoes
- F. Coveralls and other shop clothes should be washed each week

III. General shop policies

- A. Smoking is not permitted except in assigned areas
- B. Students should park in the areas reserved for student parking
- C. Students should complete a Personal Data Sheet for the General Metals program ( Assignment 1--PERSONAL DATA SHEET)
- D. Students should keep up with their assignments and responsibilities

E. Students must clean up any equipment they use

F. Students should keep record of and pay for any shop supplies used

G. All work areas should be kept clean and organized

H. Any faulty equipment should be unplugged and the instructor notified

I. Any faulty wiring should be reported to the instructor

J. Unused equipment should be left unplugged

K. Running in the shop is not permitted

L. Destroying or defacing school property can result in the student being expelled or suspended from school

M. Chewing gum should be placed in trash containers

N. Students should take part in shop activities and will be graded accordingly

# UNIT I

# INTRODUCTION TO GENERAL METALS

## INFORMATION SHEET 3--SOCIAL SECURITY

I. History and purpose

(NOTE: If you do not have a Social Security number, your instructor will help you apply for one.)

A. Government-sponsored program

(NOTE: Business and industry are required to participate in the program.)

B. Supervised by the Bureau of Old Age and Survivor's Insurance

C. Employees of any company are entitled to benefits from the program upon retirement or disability

D. Employer and employee both contribute to the program on a percentage basis.

E. Provisions are made for partial payment to persons unable to work

F. Individual numbers are issued to insure proper credit.

II. Securing a Social Security Card

A. Obtain a Social Security Application Form from the:

1. Office of Social Security Administration

2. Any post office

B. Have your instructor check your application for the correct information.

C. Return the application to the office of Social Security Administration.

III. Social Security Card

1. The card will be sent when the Social Security Office receives the application.

2. The card will have your identification number, which is used to record an employee's earnings, tax payments, and benefits.

3. The number should be memorized for later use.

4. The card should be signed immediately.

5. The number can also be used for idenification.

   (NOTE: Used on income tax returns, bank records, military service records, and other important records.)

6. Some schools and businesses use it as an identification number.

7. If the card is lost, request a new one on an application form.

   (NOTE: Do not request a new number.)

# UNIT I

# INTRODUCTION TO GENERAL METALS

## ASSIGNMENT SHEET 1--PERSONAL DATA SHEET

Directions: Print the following information for your instructor.

A. Name

________________________________

B. Home Address

________________________________

C. Home Telephone Number

________________________________

D. Name of Parent or Guardian

________________________________

E. Social Security Number

________________________________

F. Birth Date

________________________________

G. Hobbies

1. ____________________________
2. ____________________________
3. ____________________________

H. Job Experience (list all past jobs)

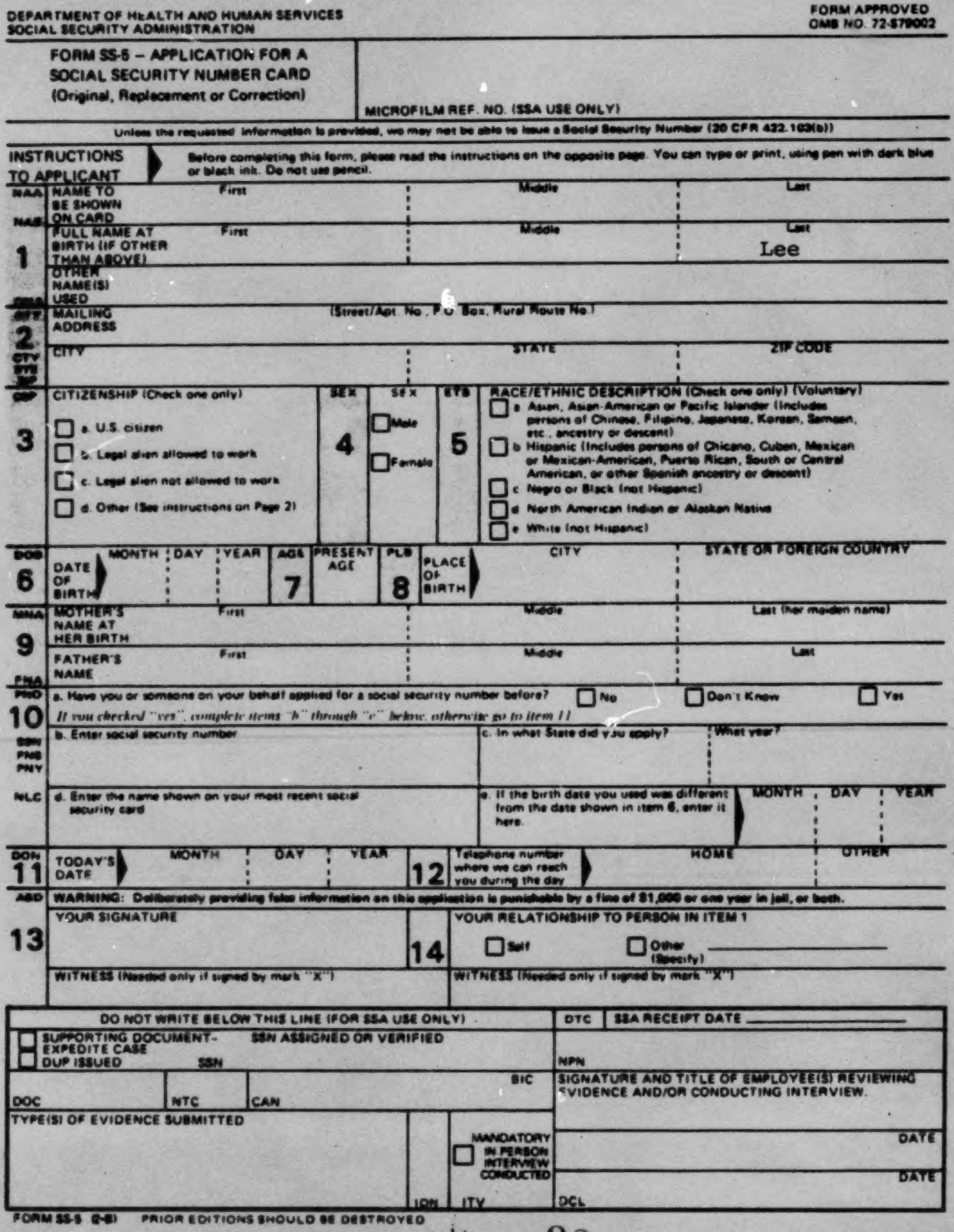
1. ____________________________
2. ____________________________
3. ____________________________

## UNIT I

## INTRODUCTION TO GENERAL METALS

## ASSIGNMENT SHEET 2--APPLICATION FOR SOCIAL SECURITY NUMBER

Directions: Using a dark blue or black ink pen, complete the application form by providing the correct information.



DEPARTMENT OF HEALTH AND HUMAN SERVICES
SOCIAL SECURITY ADMINISTRATION

FORM APPROVED
OMB NO. 72-S79002

**FORM SS-5 – APPLICATION FOR A SOCIAL SECURITY NUMBER CARD**
(Original, Replacement or Correction)

MICROFILM REF. NO. (SSA USE ONLY)

Unless the requested information is provided, we may not be able to issue a Social Security Number (20 CFR 422.103(b))

INSTRUCTIONS TO APPLICANT ▶ Before completing this form, please read the instructions on the opposite page. You can type or print, using pen with dark blue or black ink. Do not use pencil.

| | | | | |
|---|---|---|---|---|
| NAA 1 | NAME TO BE SHOWN ON CARD | First | Middle | Last |
| NAB | FULL NAME AT BIRTH (IF OTHER THAN ABOVE) | First | Middle | Last<br>Lee |
| ONA | OTHER NAME(S) USED | | | |
| 2 | MAILING ADDRESS | (Street/Apt. No., P.O. Box, Rural Route No.) | | |
| CTY STE ZIP | CITY | | STATE | ZIP CODE |

CSP 3 CITIZENSHIP (Check one only)
- ☐ a. U.S. citizen
- ☐ b. Legal alien allowed to work
- ☐ c. Legal alien not allowed to work
- ☐ d. Other (See instructions on Page 2)

SEX 4 SEX
- ☐ Male
- ☐ Female

ETB 5 RACE/ETHNIC DESCRIPTION (Check one only) (Voluntary)
- ☐ a Asian, Asian-American or Pacific Islander (Includes persons of Chinese, Filipino, Japanese, Korean, Samoan, etc., ancestry or descent)
- ☐ b Hispanic (Includes persons of Chicano, Cuban, Mexican or Mexican-American, Puerto Rican, South or Central American, or other Spanish ancestry or descent)
- ☐ c Negro or Black (not Hispanic)
- ☐ d North American Indian or Alaskan Native
- ☐ e White (not Hispanic)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| DOB 6 | DATE OF BIRTH ▶ | MONTH | DAY | YEAR | AGE 7 | PRESENT AGE | PLB 8 | PLACE OF BIRTH ▶ | CITY | STATE OR FOREIGN COUNTRY |

| | | | | |
|---|---|---|---|---|
| MNA 9 | MOTHER'S NAME AT HER BIRTH | First | Middle | Last (her maiden name) |
| FNA | FATHER'S NAME | First | Middle | Last |

PNO 10 a. Have you or someone on your behalf applied for a social security number before? ☐ No ☐ Don't Know ☐ Yes

*If you checked "yes", complete items "b" through "e" below, otherwise go to item 11*

SSN FNS FNY b. Enter social security number | c. In what State did you apply? | What year?

NLC d. Enter the name shown on your most recent social security card | e. If the birth date you used was different from the date shown in item 6, enter it here. ▶ MONTH | DAY | YEAR

DON 11 TODAY'S DATE ▶ MONTH | DAY | YEAR

12 Telephone number where we can reach you during the day ▶ HOME | OTHER

ASD WARNING: Deliberately providing false information on this application is punishable by a fine of $1,000 or one year in jail, or both.

13 YOUR SIGNATURE

14 YOUR RELATIONSHIP TO PERSON IN ITEM 1 ☐ Self ☐ Other (Specify) ____________

WITNESS (Needed only if signed by mark "X")

WITNESS (Needed only if signed by mark "X")

DO NOT WRITE BELOW THIS LINE (FOR SSA USE ONLY)

DTC | SSA RECEIPT DATE ____________

☐ SUPPORTING DOCUMENT-EXPEDITE CASE
☐ DUP ISSUED

SSN ASSIGNED OR VERIFIED

SSN

NPN

DOC | NTC | CAN | BIC

SIGNATURE AND TITLE OF EMPLOYEE(S) REVIEWING EVIDENCE AND/OR CONDUCTING INTERVIEW.

TYPE(S) OF EVIDENCE SUBMITTED

IDN | ITV

☐ MANDATORY IN PERSON INTERVIEW CONDUCTED

DATE

DATE

DCL

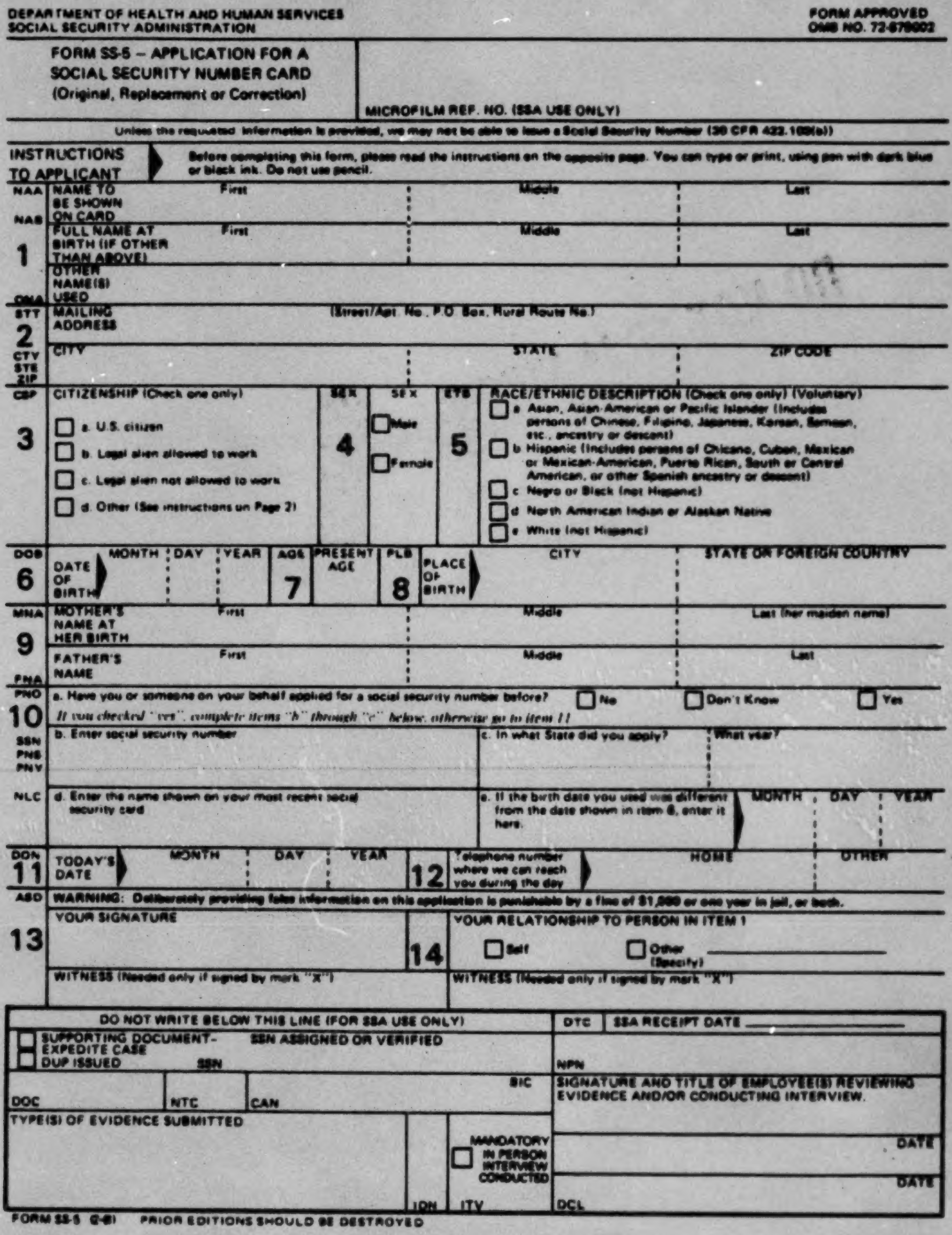
FORM SS-5 (2-81) PRIOR EDITIONS SHOULD BE DESTROYED

## UNIT I

## INTRODUCTION TO GENERAL METALS

### ASSIGNMENT SHEET 3--APPLICATION FOR A DUPLICATE CARD

Directions: Using a dark blue or black ink pen, complete the following form in requesting a duplicate card.



DEPARTMENT OF HEALTH AND HUMAN SERVICES
SOCIAL SECURITY ADMINISTRATION

FORM APPROVED
OMB NO. 72-R79002

**FORM SS-5 – APPLICATION FOR A SOCIAL SECURITY NUMBER CARD**
(Original, Replacement or Correction)

MICROFILM REF. NO. (SSA USE ONLY)

Unless the requested information is provided, we may not be able to issue a Social Security Number (20 CFR 422.103(b))

INSTRUCTIONS TO APPLICANT ▶ Before completing this form, please read the instructions on the opposite page. You can type or print, using pen with dark blue or black ink. Do not use pencil.

NAA 1 NAME TO BE SHOWN ON CARD — First | Middle | Last

NAB FULL NAME AT BIRTH (IF OTHER THAN ABOVE) — First | Middle | Last

ONA OTHER NAME(S) USED

STT 2 MAILING ADDRESS (Street/Apt. No., P.O. Box, Rural Route No.)

CTY STE ZIP CITY | STATE | ZIP CODE

CSP 3 CITIZENSHIP (Check one only)
☐ a. U.S. citizen
☐ b. Legal alien allowed to work
☐ c. Legal alien not allowed to work
☐ d. Other (See instructions on Page 2)

SEX 4 SEX
☐ Male
☐ Female

ETB 5 RACE/ETHNIC DESCRIPTION (Check one only) (Voluntary)
☐ a Asian, Asian-American or Pacific Islander (Includes persons of Chinese, Filipino, Japanese, Korean, Samoan, etc., ancestry or descent)
☐ b Hispanic (Includes persons of Chicano, Cuban, Mexican or Mexican-American, Puerto Rican, South or Central American, or other Spanish ancestry or descent)
☐ c Negro or Black (not Hispanic)
☐ d North American Indian or Alaskan Native
☐ e White (not Hispanic)

DOB 6 DATE OF BIRTH ▶ MONTH | DAY | YEAR

AGE 7 PRESENT AGE

PLB 8 PLACE OF BIRTH ▶ CITY | STATE OR FOREIGN COUNTRY

MNA 9 MOTHER'S NAME AT HER BIRTH — First | Middle | Last (her maiden name)

FNA FATHER'S NAME — First | Middle | Last

PNO 10 a. Have you or someone on your behalf applied for a social security number before? ☐ No ☐ Don't Know ☐ Yes

*If you checked "yes", complete items "b" through "e" below, otherwise go to item 11*

SSN PNS PNY b. Enter social security number | c. In what State did you apply? | What year?

NLC d. Enter the name shown on your most recent social security card | e. If the birth date you used was different from the date shown in item 6, enter it here. ▶ MONTH | DAY | YEAR

DON 11 TODAY'S DATE ▶ MONTH | DAY | YEAR

12 Telephone number where we can reach you during the day ▶ HOME | OTHER

ASD WARNING: Deliberately providing false information on this application is punishable by a fine of $1,000 or one year in jail, or both.

13 YOUR SIGNATURE

14 YOUR RELATIONSHIP TO PERSON IN ITEM 1
☐ Self ☐ Other (Specify) ____________

WITNESS (Needed only if signed by mark "X")

WITNESS (Needed only if signed by mark "X")

DO NOT WRITE BELOW THIS LINE (FOR SSA USE ONLY)

DTC | SSA RECEIPT DATE ____________

☐ SUPPORTING DOCUMENT-EXPEDITE CASE
☐ DUP ISSUED

SSN ASSIGNED OR VERIFIED

SSN

NPN

DOC | NTC | CAN | BIC

SIGNATURE AND TITLE OF EMPLOYEE(S) REVIEWING EVIDENCE AND/OR CONDUCTING INTERVIEW.

TYPE(S) OF EVIDENCE SUBMITTED

☐ MANDATORY IN PERSON INTERVIEW CONDUCTED

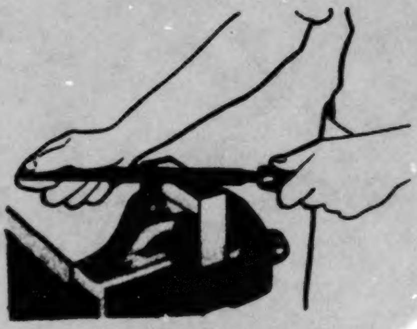
DATE

DATE

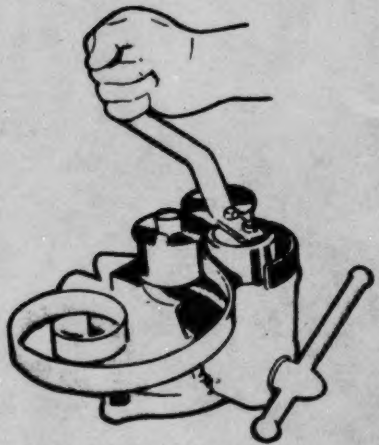
IDN | ITV | DCL

FORM SS-5 (2-81) PRIOR EDITIONS SHOULD BE DESTROYED

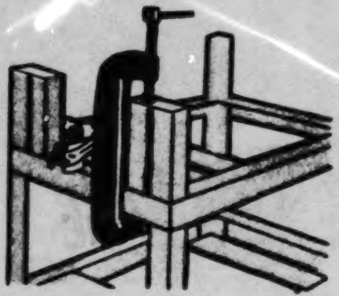
# METALWORKING OPERATIONS



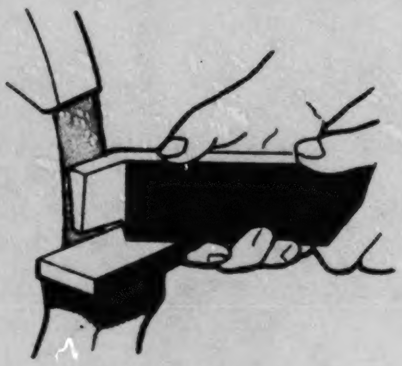
FILING OPERATION



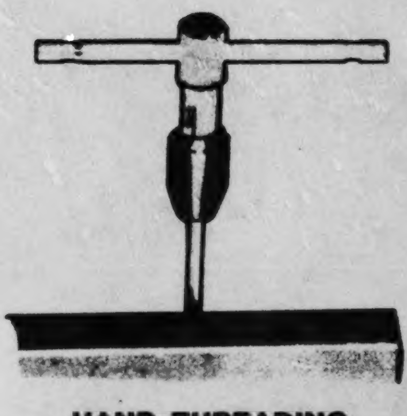
METAL BENDING



ASSEMBLY

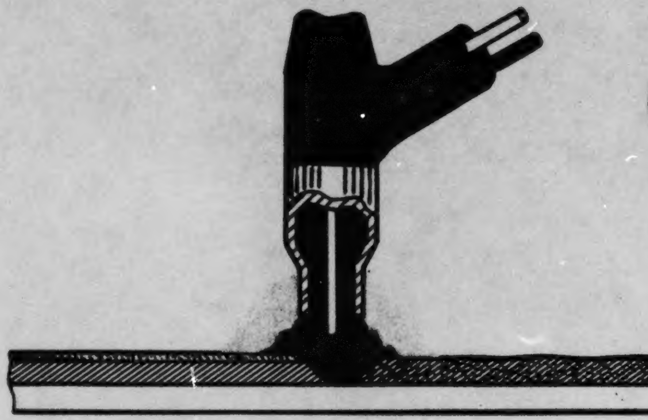


TOOL SHARPENING

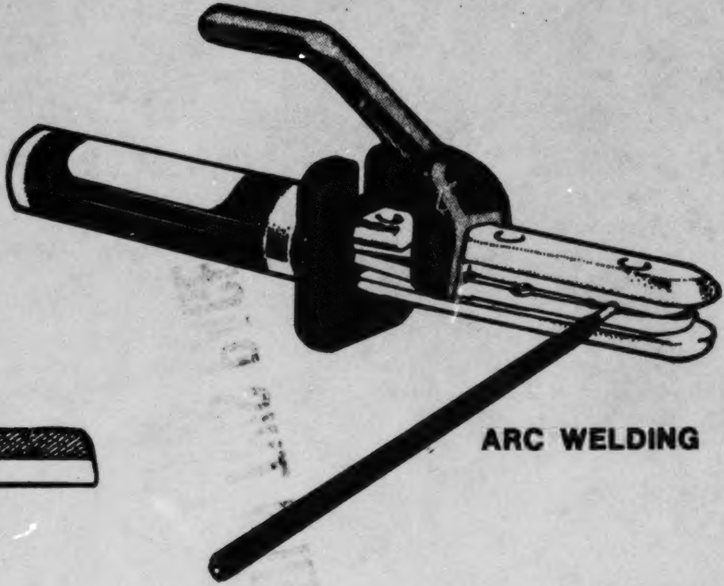


HAND THREADING

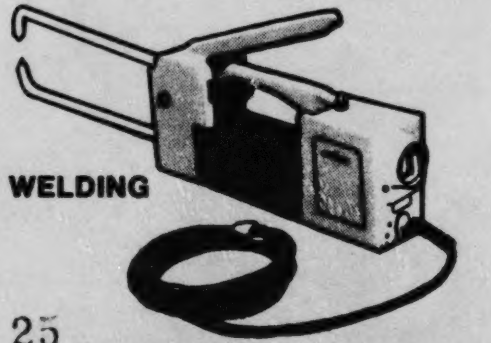
# WELDING PROCESSES



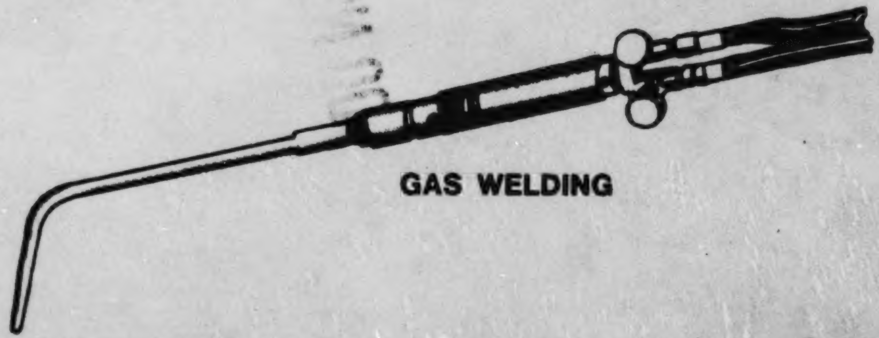
GAS SHIELDED WELDING



ARC WELDING

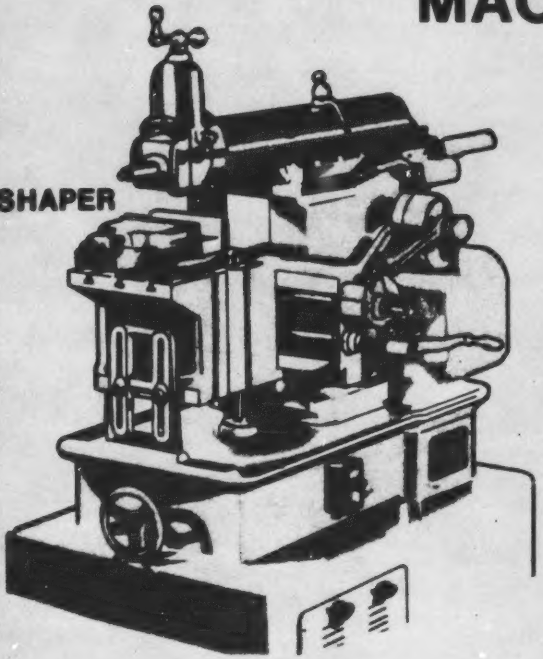


SPOT WELDING

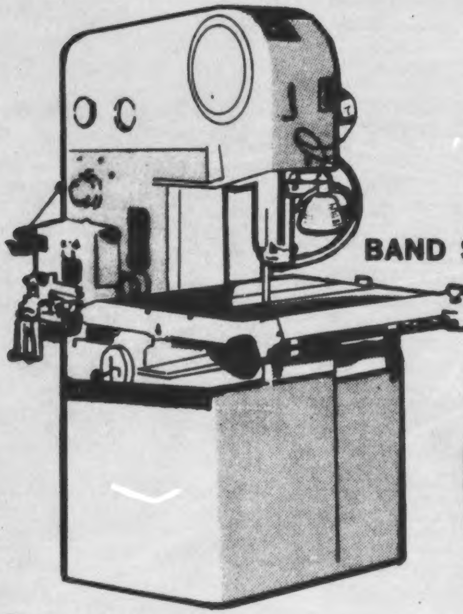


GAS WELDING

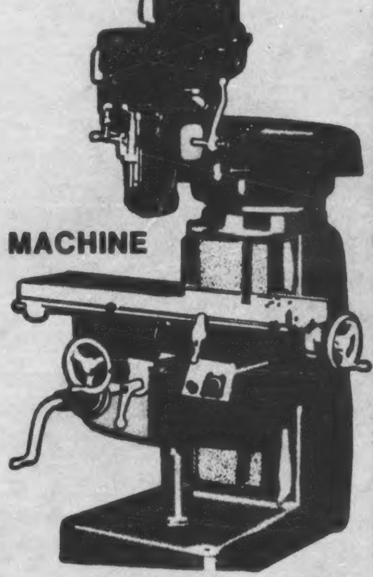
# MACHINE SHOP EQUIPMENT



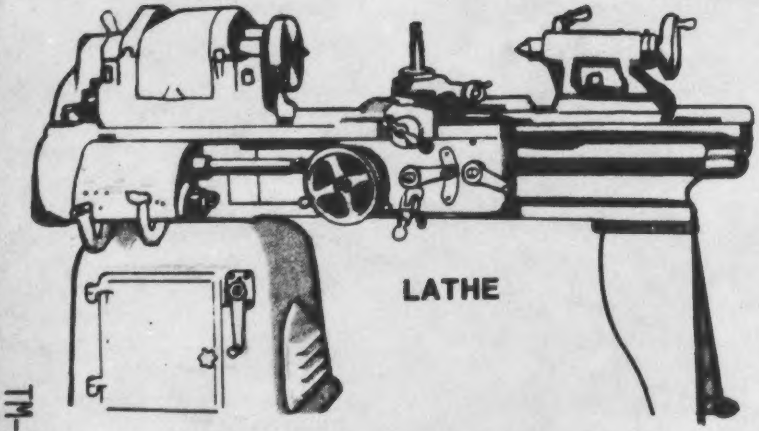
**SHAPER**



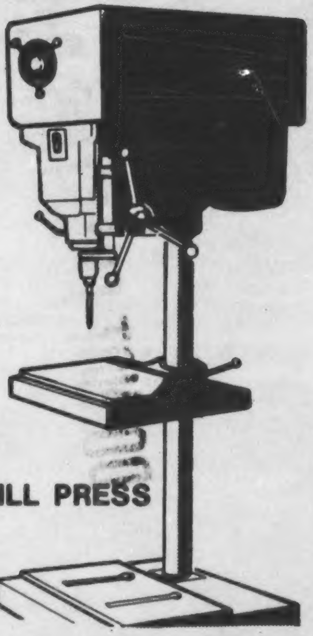
**BAND SAW**



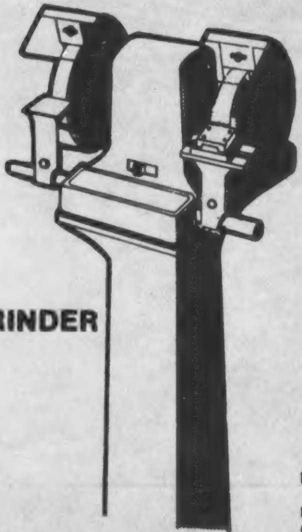
**MILLING MACHINE**



**LATHE**

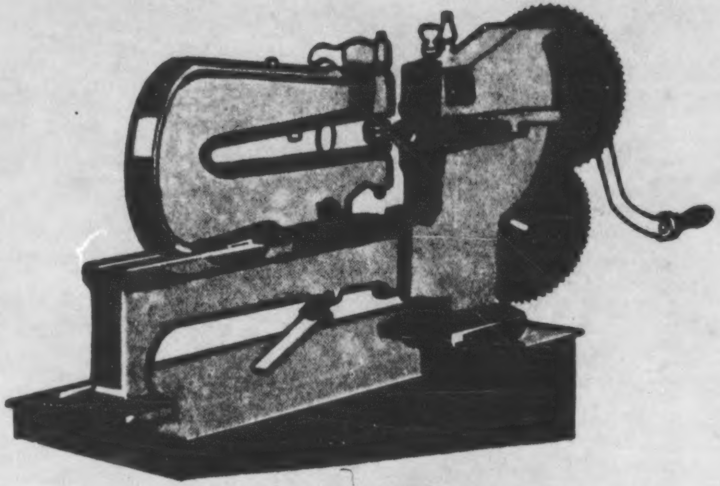


**DRILL PRESS**

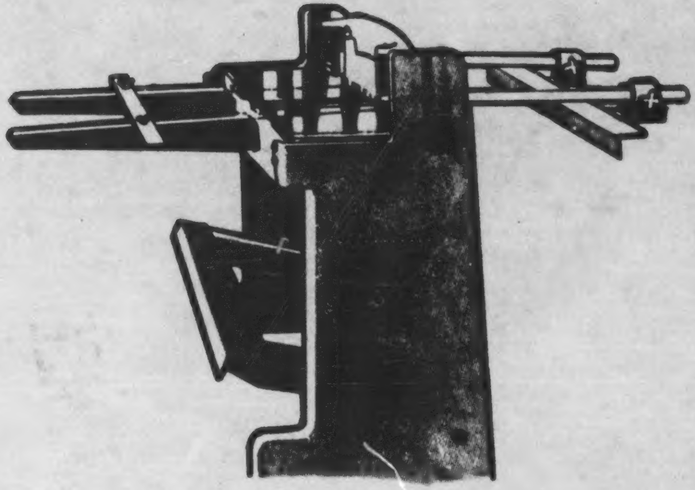


**GRINDER**

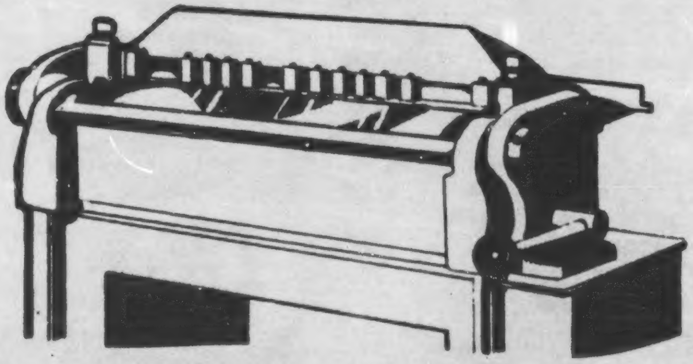
# SHEET METAL EQUIPMENT



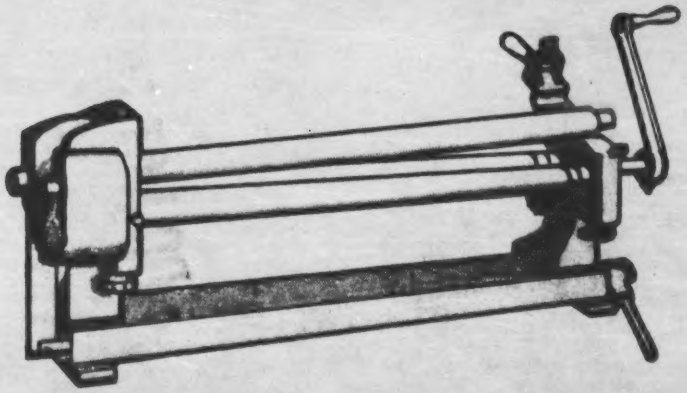
RING AND CIRCULAR SHEARS



SQUARING SHEARS

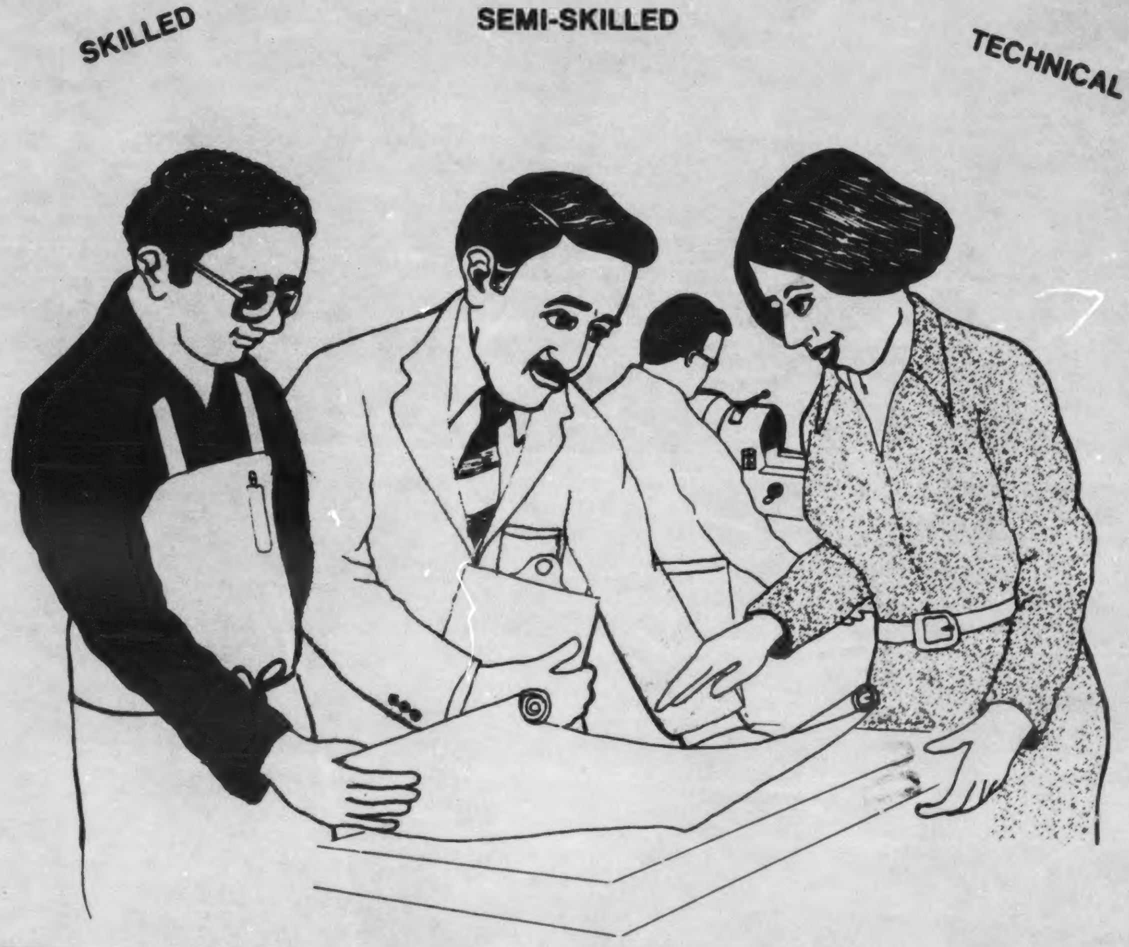


BOX AND PAN BRAKE



SLIP ROLL FORMING MACHINE

# CAREERS IN METAL WORK


SKILLED
SEMI-SKILLED
TECHNICAL

TM-5

# APPLICATION FOR SOCIAL SECURITY NUMBER

DEPARTMENT OF HEALTH AND HUMAN SERVICES
SOCIAL SECURITY ADMINISTRATION

FORM APPROVED
OMB NO. 72-R79002

**FORM SS-5 – APPLICATION FOR A SOCIAL SECURITY NUMBER CARD**
(Original, Replacement or Correction)

MICROFILM REF. NO. (SSA USE ONLY)

Unless the requested information is provided, we may not be able to issue a Social Security Number (20 CFR 422.103(b))

**INSTRUCTIONS TO APPLICANT** ▶ Before completing this form, please read the instructions on the opposite page. You can type or print, using pen with dark blue or black ink. Do not use pencil.

NAA 1 NAME TO BE SHOWN ON CARD: First | Middle | Last

NAB FULL NAME AT BIRTH (IF OTHER THAN ABOVE): First | Middle | Last

ONA OTHER NAME(S) USED

STT 2 MAILING ADDRESS (Street/Apt. No., P.O. Box, Rural Route No.)

CTY STE ZIP CITY | STATE | ZIP CODE

CSP 3 CITIZENSHIP (Check one only)
☐ a. U.S. citizen
☐ b. Legal alien allowed to work
☐ c. Legal alien not allowed to work
☐ d. Other (See instructions on Page 2)

SEX 4 SEX
☐ Male
☐ Female

ETB 5 RACE/ETHNIC DESCRIPTION (Check one only) (Voluntary)
☐ a Asian, Asian-American or Pacific Islander (Includes persons of Chinese, Filipino, Japanese, Korean, Samoan, etc., ancestry or descent)
☐ b Hispanic (Includes persons of Chicano, Cuban, Mexican or Mexican-American, Puerto Rican, South or Central American, or other Spanish ancestry or descent)
☐ c Negro or Black (not Hispanic)
☐ d North American Indian or Alaskan Native
☐ e White (not Hispanic)

DOB 6 DATE OF BIRTH ▶ MONTH | DAY | YEAR

AGE 7 PRESENT AGE

PLB 8 PLACE OF BIRTH ▶ CITY | STATE OR FOREIGN COUNTRY

MNA 9 MOTHER'S NAME AT HER BIRTH: First | Middle | Last (her maiden name)

FNA FATHER'S NAME: First | Middle | Last

PNO 10 a. Have you or someone on your behalf applied for a social security number before? ☐ No ☐ Don't Know ☐ Yes

*If you checked "yes", complete items "b" through "e" below, otherwise go to item 11*

SSN PNS PNY b. Enter social security number | c. In what State did you apply? | What year?

NLC d. Enter the name shown on your most recent social security card | e. If the birth date you used was different from the date shown in item 6, enter it here. ▶ MONTH | DAY | YEAR

DON 11 TODAY'S DATE ▶ MONTH | DAY | YEAR

12 Telephone number where we can reach you during the day ▶ HOME | OTHER

ASD WARNING: Deliberately providing false information on this application is punishable by a fine of $1,000 or one year in jail, or both.

13 YOUR SIGNATURE

14 YOUR RELATIONSHIP TO PERSON IN ITEM 1
☐ Self ☐ Other (Specify) ____________

WITNESS (Needed only if signed by mark "X")

WITNESS (Needed only if signed by mark "X")

DO NOT WRITE BELOW THIS LINE (FOR SSA USE ONLY)

☐ SUPPORTING DOCUMENT-EXPEDITE CASE
☐ DUP ISSUED

SSN ASSIGNED OR VERIFIED

SSN

DTC | SSA RECEIPT DATE ____________

NPN

DOC | NTC | CAN | BIC

SIGNATURE AND TITLE OF EMPLOYEE(S) REVIEWING EVIDENCE AND/OR CONDUCTING INTERVIEW

TYPE(S) OF EVIDENCE SUBMITTED

☐ MANDATORY IN PERSON INTERVIEW CONDUCTED

DATE

DATE

IDN | ITV | DCL

FORM SS-5 (2-81) PRIOR EDITIONS SHOULD BE DESTROYED

# UNIT I

# INTRODUCTION TO GENERAL METALS

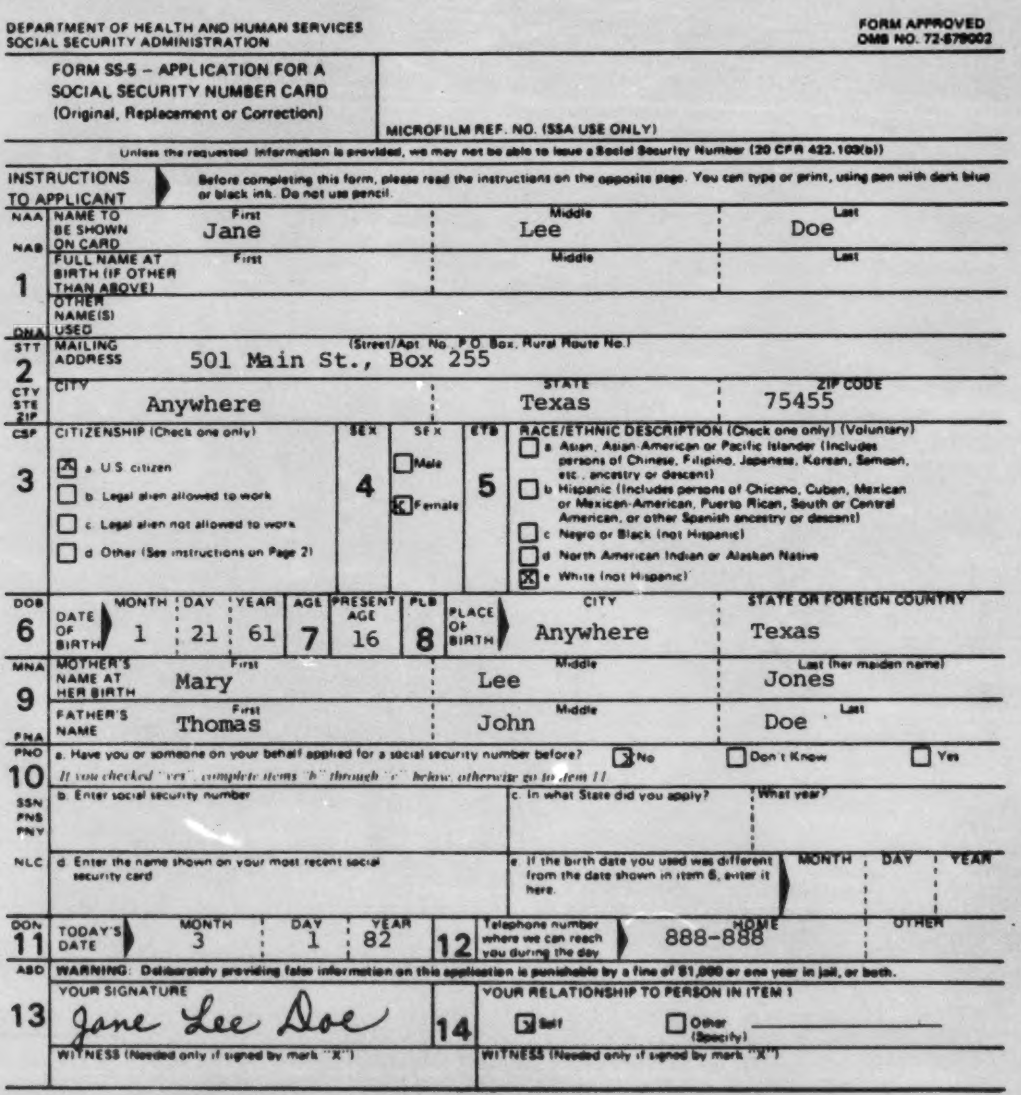
## ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet #1

Evaluated to the satisfaction of the instructor

Assignment Sheet #2

The completed form should be neatly printed and provide the following types of information:



**DEPARTMENT OF HEALTH AND HUMAN SERVICES**
**SOCIAL SECURITY ADMINISTRATION**

**FORM APPROVED**
**OMB NO. 72-R79002**

**FORM SS-5 – APPLICATION FOR A SOCIAL SECURITY NUMBER CARD**
**(Original, Replacement or Correction)**

MICROFILM REF. NO. (SSA USE ONLY)

Unless the requested information is provided, we may not be able to issue a Social Security Number (20 CFR 422.103(b))

INSTRUCTIONS TO APPLICANT: Before completing this form, please read the instructions on the opposite page. You can type or print, using pen with dark blue or black ink. Do not use pencil.

NAA 1 NAME TO BE SHOWN ON CARD: First Jane | Middle Lee | Last Doe
NAB FULL NAME AT BIRTH (IF OTHER THAN ABOVE): First | Middle | Last
ONA OTHER NAME(S) USED:
STT 2 MAILING ADDRESS (Street/Apt. No., P.O. Box, Rural Route No.): 501 Main St., Box 255
CTY STE ZIP CITY: Anywhere | STATE: Texas | ZIP CODE: 75455

CSP 3 CITIZENSHIP (Check one only)
☒ a. U.S. citizen
☐ b. Legal alien allowed to work
☐ c. Legal alien not allowed to work
☐ d. Other (See instructions on Page 2)

SEX 4 SEX
☐ Male
☒ Female

ETB 5 RACE/ETHNIC DESCRIPTION (Check one only) (Voluntary)
☐ a. Asian, Asian-American or Pacific Islander (Includes persons of Chinese, Filipino, Japanese, Korean, Samoan, etc., ancestry or descent)
☐ b. Hispanic (Includes persons of Chicano, Cuban, Mexican or Mexican-American, Puerto Rican, South or Central American, or other Spanish ancestry or descent)
☐ c. Negro or Black (not Hispanic)
☐ d. North American Indian or Alaskan Native
☒ e. White (not Hispanic)

DOB 6 DATE OF BIRTH: MONTH 1 | DAY 21 | YEAR 61
AGE 7 PRESENT AGE: 16
PLB 8 PLACE OF BIRTH: CITY Anywhere | STATE OR FOREIGN COUNTRY Texas

MNA 9 MOTHER'S NAME AT HER BIRTH: First Mary | Middle Lee | Last (her maiden name) Jones
FNA FATHER'S NAME: First Thomas | Middle John | Last Doe

PNO 10 a. Have you or someone on your behalf applied for a social security number before? ☒ No ☐ Don't Know ☐ Yes
*If you checked "yes", complete items "b" through "e" below, otherwise go to item 11*
SSN PNS PNY b. Enter social security number | c. In what State did you apply? | What year?
NLC d. Enter the name shown on your most recent social security card | e. If the birth date you used was different from the date shown in item 6, enter it here. MONTH | DAY | YEAR

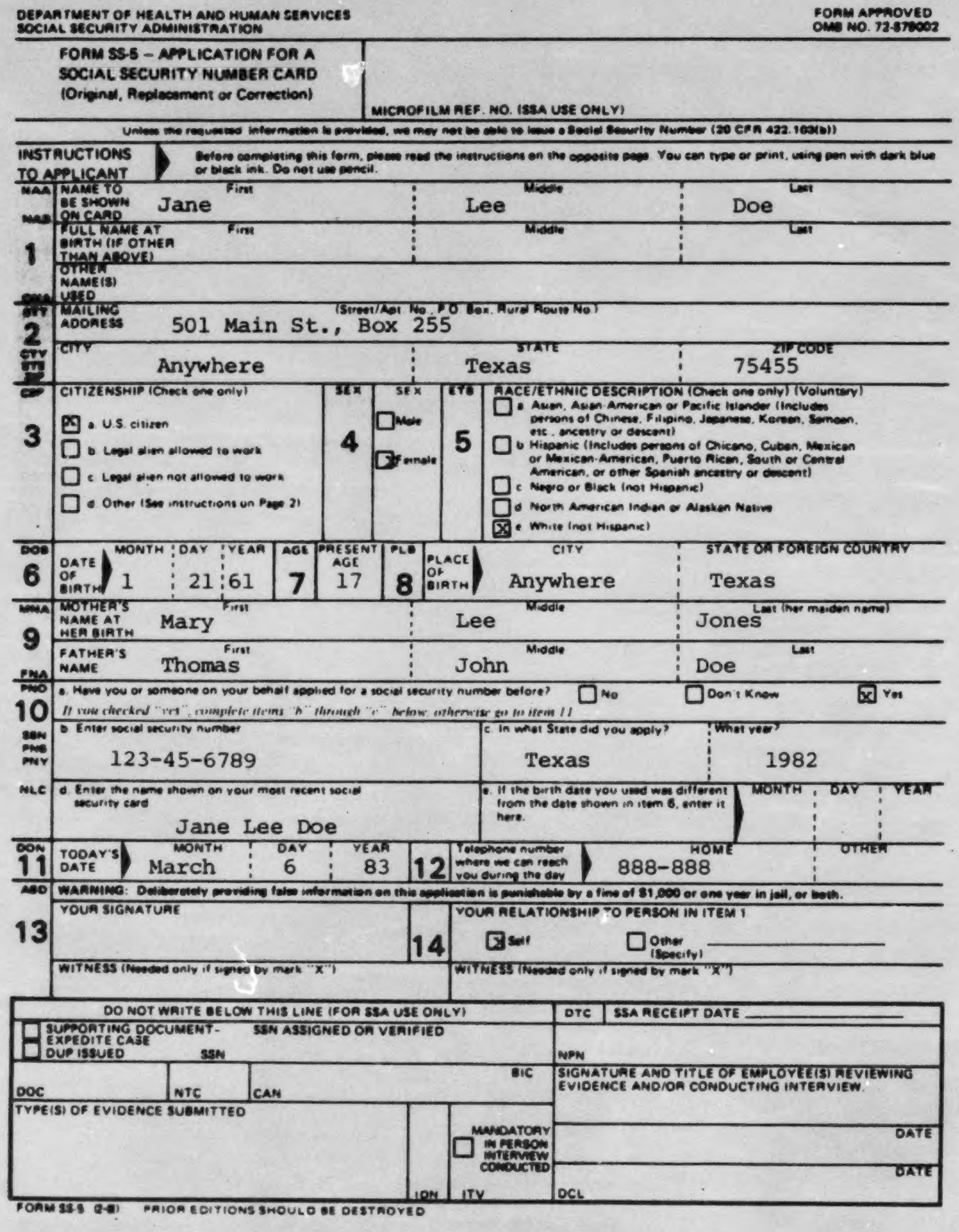
DON 11 TODAY'S DATE: MONTH 3 | DAY 1 | YEAR 82
12 Telephone number where we can reach you during the day: HOME 888-888 | OTHER

ASD WARNING: Deliberately providing false information on this application is punishable by a fine of $1,000 or one year in jail, or both.

13 YOUR SIGNATURE: Jane Lee Doe
14 YOUR RELATIONSHIP TO PERSON IN ITEM 1: ☒ Self ☐ Other (Specify) ____________
WITNESS (Needed only if signed by mark "X")
WITNESS (Needed only if signed by mark "X")

## Assignment Sheet #3

The completed form for requesting a duplicate card should be similar to the following:



DEPARTMENT OF HEALTH AND HUMAN SERVICES
SOCIAL SECURITY ADMINISTRATION

FORM APPROVED
OMB NO. 72-S79002

**FORM SS-5 – APPLICATION FOR A SOCIAL SECURITY NUMBER CARD**
(Original, Replacement or Correction)

MICROFILM REF. NO. (SSA USE ONLY)

Unless the requested information is provided, we may not be able to issue a Social Security Number (20 CFR 422.103(b))

INSTRUCTIONS TO APPLICANT: Before completing this form, please read the instructions on the opposite page. You can type or print, using pen with dark blue or black ink. Do not use pencil.

**1**
NAA NAME TO BE SHOWN ON CARD: First Jane; Middle Lee; Last Doe
NAB FULL NAME AT BIRTH (IF OTHER THAN ABOVE): First; Middle; Last
ONA OTHER NAME(S) USED:

**2**
STT MAILING ADDRESS (Street/Apt. No., P.O. Box, Rural Route No.): 501 Main St., Box 255
CTY STE ZIP CITY: Anywhere; STATE: Texas; ZIP CODE: 75455

**3** CSP CITIZENSHIP (Check one only)
☒ a. U.S. citizen
☐ b. Legal alien allowed to work
☐ c. Legal alien not allowed to work
☐ d. Other (See instructions on Page 2)

**4** SEX: SEX
☐ Male
☒ Female

**5** ETB RACE/ETHNIC DESCRIPTION (Check one only) (Voluntary)
☐ a Asian, Asian-American or Pacific Islander (Includes persons of Chinese, Filipino, Japanese, Korean, Samoan, etc., ancestry or descent)
☐ b Hispanic (Includes persons of Chicano, Cuban, Mexican or Mexican-American, Puerto Rican, South or Central American, or other Spanish ancestry or descent)
☐ c Negro or Black (not Hispanic)
☐ d North American Indian or Alaskan Native
☒ e White (not Hispanic)

**6** DOB DATE OF BIRTH: MONTH 1; DAY 21; YEAR 61
**7** AGE: PRESENT AGE 17
**8** PLB PLACE OF BIRTH: CITY Anywhere; STATE OR FOREIGN COUNTRY Texas

**9**
MNA MOTHER'S NAME AT HER BIRTH: First Mary; Middle Lee; Last (her maiden name) Jones
FNA FATHER'S NAME: First Thomas; Middle John; Last Doe

**10** PNO a. Have you or someone on your behalf applied for a social security number before? ☐ No ☐ Don't Know ☒ Yes
*If you checked "yes", complete items "b" through "e" below; otherwise go to item 11*
SSN b. Enter social security number: 123-45-6789
PNS c. In what State did you apply? Texas
PNY What year? 1982
NLC d. Enter the name shown on your most recent social security card: Jane Lee Doe
e. If the birth date you used was different from the date shown in item 6, enter it here. MONTH; DAY; YEAR

**11** DON TODAY'S DATE: MONTH March; DAY 6; YEAR 83
**12** Telephone number where we can reach you during the day: HOME 888-888; OTHER

ASD WARNING: Deliberately providing false information on this application is punishable by a fine of $1,000 or one year in jail, or both.

**13** YOUR SIGNATURE
WITNESS (Needed only if signed by mark "X")

**14** YOUR RELATIONSHIP TO PERSON IN ITEM 1
☒ Self ☐ Other (Specify) ____________________
WITNESS (Needed only if signed by mark "X")

DO NOT WRITE BELOW THIS LINE (FOR SSA USE ONLY)
DTC; SSA RECEIPT DATE ____________________
☐ SUPPORTING DOCUMENT-EXPEDITE CASE
☐ DUP ISSUED
SSN ASSIGNED OR VERIFIED; SSN
NPN
DOC; NTC; CAN; BIC
SIGNATURE AND TITLE OF EMPLOYEE(S) REVIEWING EVIDENCE AND/OR CONDUCTING INTERVIEW.
TYPE(S) OF EVIDENCE SUBMITTED
☐ MANDATORY IN PERSON INTERVIEW CONDUCTED
DATE
DATE
IDN; ITV; DCL

FORM SS-5 (2-81) PRIOR EDITIONS SHOULD BE DESTROYED

# UNIT I

# INTRODUCTION TO GENERAL METALS

## TEST--PART 1

1. Match each of the terms to the correct definition by placing the numbers in the correct blanks.

____a. Becoming familiar with classmates, shop policies and information, type of work involved, and responsibilities

____b. A method of checking the student's understanding of the information in a unit.

____c. The activities which help relate the information provided in the information sheets.

____d. The kind or type of work that a person chooses as a way to earn money.

____e. The Federal Insurance Contributions Act

____f. A system of rules governing conduct and activities.

____g. Coordinated vocational academic education

____h. A shop that uses power driven tools to produce accurate and uniform parts that are assembled into thousands of useful items.

____i. Provides a list of items and procedures necessary to perform a skill.

____j. The manner of acting, feeling, or thinking that shows a person's personality.

____k. A process by which two or more pieces of metal are joined into a single unit by heating them to a temperature high enough to cause them to melt and combine.

1. Assignment sheet
2. Attitude
3. Career
4. CVAE
5. Discipline
6. FICA
7. Job sheet
8. Machine shop
9. Orientation
10. Evaluation
11. Credit
12. Fabrication
13. Information sheet
14. Metallurgy
15. Objective sheet
16. Sheet metal work
17. Welding

____l. The certification of a student's completion of a unit of instruction or course of study to the instructor's satisfaction.

____m. Working with thin sheets of material to form, shape, or join the material into useful articles.

____n. The processing of metals as they are made into commercial products

____o. Provides the information necessary to complete the unit

____p. The forming, shaping, and assembly of material to make a product

____q. State the types of performance the student will do to satisfactorily complete the unit.

2. Point out the areas of instruction in General Metals by placing a "✓" in front of each.

____a. Orientation

____b. Basic metal work and fabrication

____c. Welding

____d. Wood carving

____e. Sheetmetal

____f. Horseshoeing

3. Point out the (1) semiskilled, (2) skilled, and (3) technical careers available in metal working by writing 1, 2, or 3 in front of each listed below.

____a. Machinist

____b. Machine programmer

____c. Production lathe operator

____d. Supervisor

____e. Metal fabricator

____f. Tool and die maker

____g. Cost estimator

____h. Welder's Helper

## UNIT I

## INTRODUCTION TO GENERAL METALS

### TEST--PART 2

1. Explain the school policies and regulations by writing a short description for each of the following:

   a. Grading system

   b. Report card time periods

   c. Excused and unexcused absences

   d. Schedule changes

   e. Extended illness and doctor statements

   f. "Make up" policy for school work missed

   g. Class attendance, hall passes, and tardy policies

   h. Suspension and expulsion

   i. Exemption program guidelines

2. Select the correct clothing to be worn in the shop by circling the number of each correct answer below.

    a. One type of clothing that should not be worn in shop is:

        (1) shoes

        (2) jewelry

        (3) glasses

    b. Clothing worn around machines should fit:

        (1) snugly

        (2) loosely

        (3) everyone

    c. When welding, your clothes should not be:

        (1) long sleeved

        (2) frayed or oily

        (3) clean and neat

    d. The best type of protective clothing to wear is:

        (1) a Sunday suit

        (2) gym shorts

        (3) coveralls

    e. The best shoes to be worn when welding is:

        (1) boots

        (2) tennis

        (3) low-top

    f. Coverall and other shop clothing should be washed:

        (1) as little as possible

        (2) once a week

        (3) once a year

3. Point out the correct general shop policies by writing "True or "False" in the space provided.

    ____ a. Smoking is permitted in the shop

____ b. Students should park in areas reserved for student parking.

____ c. Students should complete a Personal Data Sheet for the General Metals program.

____ d. Students should keep up with their assignments and responsibilities.

____ e. Equipment is to be cleaned by the person that uses it last.

____ f. Students must keep record of and pay for any shop supplies used.

____ g. Work areas should be left dirty and cluttered.

____ h. Any faulty equipment should be unplugged and the instructor notified.

____ i. Faulty wiring should be repaired by the student.

____ j. Unused equipment should be left unplugged.

____ k. Running in the shop is not permitted.

____ l. Destroying school property can result in the student being expelled or suspended from school.

____ m. Chewing gum should be thrown on the floor.

____ n. Students should take part in shop activities and will be graded accordingly.

## UNIT I

## INTRODUCTION TO GENERAL METALS

### TEST--PART 3

1. Explain the Social Security system by underlining the words that correctly complete each of the following.

   a. The (union, government) sponsors the Social Security program.

   b. It is supervised by the Bureau of (Old Age and Survivor's Insurance, Welfare).

   c. (Employers, Employees) are entitled to benefits of the program.

   d. Employer and employee both contribute to the program on a (10 to 1, percentage) basis.

   e. Provisions for partial payment are made due to loss of (house, earnings).

   f. Individual numbers are issued to insure proper (credit, earnings).

   g. Social Security application forms may be obtained from the office of the Social Security Administration and from your local (bank, post office).

   h. You should have your (doctor, instructor) check the application for the correct information.

   i. The card will be sent when the Social Security office receives (the application, your money).

   j. The card will have your identification number, which is used to record an employee's earnings, tax payments, and (benefits, sick leave).

   k. The number should be (forgotten until needed, memorized for later use).

   l. The card should be signed (immediately, in the near future).

   m. The number can also be used for (car tags, identification).

   n. Some schools and businesses use it as (an identification number, layoff selection system).

   o. If the card is lost a new (card, number) should be requested.

## UNIT I

## INTRODUCTION TO GENERAL METALS

### ANSWERS TO TESTS--PART 1

1. a. 9
   b. 10
   c. 1
   d. 3
   e. 6
   f. 5
   g. 4
   h. 8
   i. 7
   j. 2
   k. 17
   l. 11
   m. 16
   n. 14
   o. 13
   p. 12
   q. 15

2. a. ✓
   b. ✓
   c. ✓
   e. ✓

3. a. 2
   b. 3
   c. 1
   d. 2
   e. 1
   f. 2
   g. 3
   h. 1

### PART 2

1. An acceptable answer should include information of each of these policies enforces at the local school.

2. a. 2
   b. 2
   c. 2
   d. 3
   e. 1
   f. 2

3. a. false
   b. true
   c. true
   d. true
   e. false
   f. true
   g. false
   h. true
   i. false
   j. true
   k. true
   l. true
   m. false
   n. true

### PART 3

a. government
b. Old Age and Surviror's Insurance
c. Employees
d. percentage
e. earnings
f. credit
g. post office
h. instructor
i. the application
j. benefits
k. memorized for later use
l. immediately
m. identification
n. identification number
o. card

# UNIT II

## YOUTH LEADERSHIP

## UNIT OBJECTIVE

After completing this unit, the student will be able to explain the purposes and organization of the VOCT club as well as plan and participate in the club meetings and activities. This knowledge will be evidenced through demonstration and by satisfactorily completing the unit test.

## SPECIFIC OBJECTIVES

After completing this unit, the student will be able to:

1. Point out the purposes of the VOCT organization.
2. Explain the meaning of the VOCT creed.
3. Write (or state) the VOCT pledge.
4. Explain the meaning of the VOCT motto.
5. Point out the VOCT colors.
6. Select the correct code of ethics.
7. Point out the meaning of the VOCT symbols.
8. Identify the duties and symbols of the offices for VOCT.
9. Point out the things that make a good VOCT meeting.
10. Point out the correct order of business for VOCT meetings.
11. Point out the purposes of club activities.
12. Select the types of club activities.
13. List the reasons for planning a yearly calendar.
14. Select the events that should be placed on a club calendar.
15. Prepare a yearly calendar.
16. Receive travel permission from parents for VOCT events.

# UNIT II

# YOUTH LEADERSHIP

## SUGGESTED TEACHING ACTIVITIES

I. Objective Sheet

  A. Discuss unit objectives with students

  B. Discuss each specific objective with the students

  C. Have the student complete the objectives in the most logical sequence for the shop organization.

  D. Add any necessary objectives

II. Information and Assignment Sheets

  A. INFORMATION SHEET 1--INTRODUCTION TO VOCT

    1. Display pictures, VOCT Newsletters, banners, and other items that might explain the VOCT organization

    2. Have a student who has participated in VOCT during the previous year to explain the club's activities

    3. Explain to the students what is meant by a "democratic process"

    4. Show VOCT Slide Tape presentation (see references)

  B. INFORMATION SHEET 2--CLUB MEETINGS

    1. Display the officer symbols

    2. Provide students with VOCT Leadership Handbooks for complete lists of officer duties

    3. Have students decide which offices they would like to hold

    4. Assign a time for the first club meeting, when officers will be elected

    5. Have students complete ASSIGNMENT SHEET 1--PREPARE A CLUB CALENDAR for use at the first club meeting

  C. INFORMATION SHEET 3--GUIDELINES FOR CLUB ACTIVITIES

    1. Show pictures or scrapbooks of previous club activities

    2. Provide information about school holidays and events to be included when preparing a club calendar

3. Using the Competitive Activities Guide, explain the types of contests that are held at the area and state levels

4. Have students complete ASSIGNMENT SHEET 2--RECEIVING TRAVEL PERMISSION for your file

III. Transparency Masters

(NOTE: Transparency masters are included in the student manuals as information sheets.)

A. TM-1--VOCT EMBLEM

B. TM-2--LOCAL CHAPTER

C. TM-3--SYMBOLS FOR THE OFFICES OF VOCT

D. TM-4--SUGGESTED CALENDAR

IV. Evaluation

A. The test is divided into three parts

(NOTE: Each part covers one information sheet.)

B. Various approaches may be used in testing

1. The test in this unit may be given orally to check the students' understanding of VOCT rather than for a recorded grade

2. Each part of the test may be given as the student completes studying the information on one information sheet

3. Give the entire test upon completion of all the information sheets in the unit

4. Give one or more parts of the evaluation as an additional assignment, or to reinforce areas the student did not understand

C. Add test parts corresponding to any information area or sheets added to the unit.

V. Answers to test

A. Answers are based on the total information covered in the unit

B. For convenience of grading, make corresponding answer sheets for additional test parts

VI. References

A. VOCT Leadership Handbook. Occupational Curriculum Laboratory. East Texas State University. Commerce, Texas, 75428

B. VOCT Competitive Activities Guide. Occupational Curriculum Laboratory. East Texas State University. Commerce, Texas, 75428

C. Developing Skilled Manpower Citizens and Leaders for Industry. Occupational Curriculum Laboratory. East Texas State University. Commerce, Texas, 75428

VII. Audiovisuals

A. VOCT Slide-Tape Presentation. Occupational Curriculum Laboratory, East Texas State University, Commerce, Texas 75428.

# UNIT II

# YOUTH LEADERSHIP

## INFORMATION SHEET 1--INTRODUCTION TO VOCT

I. Purposes of the VOCT organization

   A. To develop a respect for education through academic experiences coordinated with vocational skill development

   B. To promote an understanding and appreciation for the responsibilities of citizenship, the world of work, and the American way of life

   C. To develop leadership abilities through participation in educational, vocational, civic, recreational, and social activities

   D. To develop the ability of students to organize activities through the use of the democratic process

   E. To further develop respect for all individuals,as well as to develop self-respect

   F. To motivate students through involvement in competiting events and local club activities

   G. To strengthen the confidence of students in themselves and their work

   H. To develop individual pride in one's trade

II. VOCT Creed

   A. I believe in the worthiness of work and I will try my best to be a good worker

   B. I believe in freedom and the American way of life

   C. I believe in education and I will try to make the best use of the knowledge and skills that I learn

   D. I believe in being fair and honest

   E. I believe to gain respect for myself I must be respectful of others

   F. I believe satisfaction is gained from good work

III. VOCT Pledge

Upon my honor, I will train myself through study and practice to become an honorable worker. I will uphold the ideals of my vocation and the Vocational Opportunities Clubs of Texas

IV. VOCT Motto

Preparing today for the world of work

V. VOCT Colors

Red, white, and blue, the colors of our great state and nation

VI. VOCT Code of Ethics

VOCT Members should:

A. Exercise proper respect for the rights of others

B. Respect and obey the rules and policies of the school

C. Dress in an appropriate and acceptable manner for all occasions

D. Take an active part in all club work

E. Uphold and practice the true meaning of the creed and pledge

F. Be a good sport in all club-sponsored activities

G. Strive for better health of body and mind

H. Be industrious at school and at work so that a better knowledge of the chosen occupation might be obtained

I. Practice the golden rule

VII. The meaning of the VOCT symbols

A. Gavel--Represents the principles of justice to all

B. Lone Star of Texas--The five points represent the home, the school, industry, the community, and the state of Texas

C. Scriber and Tablet--Represents the history of man

D. Balance--Represents justice in the weighing of labor and its rewards

E. Clock and Pen--Represents the passing of time and the necessary reporting of what we do

F. Shield--Represents patriotism

G. Key--Represents safekeeping of club equipment and members

H. Triangle--Represents guidance to help club members obtain knowledge, gain experience, and develop skills

# UNIT II

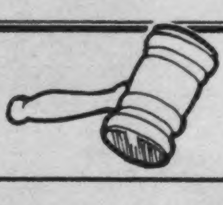
# YOUTH LEADERSHIP

## INFORMATION SHEET 2 -- CLUB MEETINGS

I. Officers duties and symbols

A. **President** --Conducts meetings according to parlimentary procedure

**GAVEL**

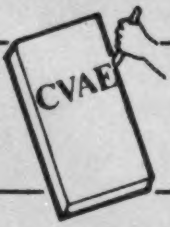


**STAR**

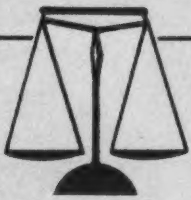
B. **Vice-President** --Assists the president and takes responsibility for committees

C. **Secretary** --Prepares and reads minutes of meetings

**SCRIBER & TABLET**



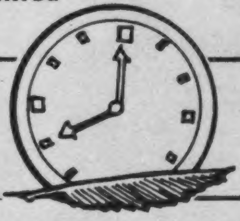
**BALANCE**



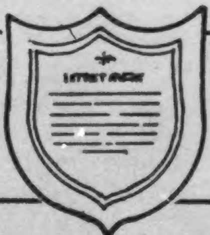
D. **Treasurer** --Receives and keeps chapter funds in a safe, businesslike manner

E. **Reporter** --Takes care of all club publicity

**CLOCK & PEN**



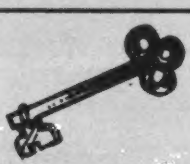
**SHIELD**



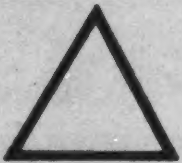
F. **Parliamentarian** --Advises the club officers on points of parliamentary procedure

G. **Sergeant-at-Arms** --Arranges meeting room and cares for chapter equipment

**KEY**



**TRIANGLE**



H. **Advisor** --Assumes the responsibility of starting the chapter and giving advice concerning club business to members

II. Things that make a good meeting

- A. Carefully planning in advance
- B. Starting and closing the meeting on time
- C. Moving the business meeting along with enthusiasm
- D. Following the order of business explained in the Leadership Handbook
- E. Using correct parliamentary procedure
- F. Using the official opening and closing ceremonies
- G. Displaying chapter and officer banners
- H. Holding meetings in a comfortable meeting place
- I. Presenting well-prepared committee reports
- J. Demonstrating knowledge of the duties of one's office
- K. Holding the interest and attention of all members
- L. Providing an opportunity for all members to participate
- M. Teaching members to work together
- N. Including both business and entertainment

III. Order of a business meeting

- A. Opening ceremony
    - 1. Officers explain their symbols and duties
    - 2. Pledge of allegience
    - 3. Introduction of guests
- B. Regular order of business
    - 1. Roll call
    - 2. Minutes of previous meeting
    - 3. Reports by officers
    - 4. Committee reports
        - a. Standing committees
        - b. Special committees

5. Unfinished business
6. New business

C. Program

1. Speakers
2. Educational activities

   Examples: Films and demonstrations

3. Presentation of honors and awards

D. Special ceremonies-when necessary

1. Initiations
2. Installation of officers
3. Granting of honorary memberships

E. Closing ceremony

F. Entertainment

## UNIT II

## YOUTH LEADERSHIP

### INFORMATION SHEET 3--GUIDELINES FOR CLUB ACTIVITIES

I. Purposes of club activities

  A. To develop a spirit of cooperation

  B. Provide an understanding of competition

  C. Present a recognition of social values

  D. To develop an ability to communicate

  E. Provide for individual recognition

  F. Realization of the responsibilities of leadership and fellowship

II. Types of activities

  A. Civic--Projects that produce good public relations and opinion of the club within the community

  B. Educational--Activities that relate to the students career goals training

  C. Recreational--Activities that provide body and mind building exercises

  D. Social--Events that can help the student learn how to mix with and enjoy the company of other people

  E. Vocational--Activities that relate to the skill training of the student

III. Reasons for planning a yearly calendar

  A. Provides a working plan that may be built upon

  B. Organizes all of the chapter's activities

  C. Keeps the students informed

  D. Keeps others informed

    1. Vocational Director

    2. Principal

    3. Community

  E. Is a means of publicity

IV. Things to include on a yearly calendar

- A. All official chapter functions
- B. All contests
- C. Contest practice and preparation times
- D. Publicity deadlines

  Examples:
  1. VOCT *Newsletter* (September, January, April)
  2. Contest awards
  3. Special projects
- E. Alternate dates for special events

  Examples:
  1. Employer-employee banquet
  2. Project exhibits
  3. Community services
  4. Fund raisers

# UNIT II

## YOUTH LEADERSHIP

### ASSIGNMENT SHEET 1--PREPARE A CLUB CALENDAR

Directions: Use the following list of VOCT club activities and any others brainstormed by the club members to develop a year's calendar. Use the calendar form on the next page to organize the events by month

Field Trips

Radio or TV Program

Fund Raising

Fair Exhibit

Boss Breakfast

Assembly Program

Regular Meetings

Alumni Activities

Social Activities

Civic Club Appearances

Panel Discussion

Homecoming Parade

Chapter Newsletter

Faculty Recognition

Election of Officers

Helping Hand Project

Professional Meetings

Savings Club Program

Area and State Leadership Conference

Fashion Show

Radio Program

Parents' Night

Guest Speakers

Installation of Officers

Local Publicity Releases

Initiation of New Members

Employer-Employee Banquet

"Good Citizenship" Project

"Get-Out-To-Vote" Project

"Cleanup" Project

Executive Committee Meetings

"Student Day" at Local Businesses

Reception for Prospective Students

Follow-up Survey of Former Students

Advisory Committee Meetings

Area and State Contest

# CLUB CALENDAR

| | |
|---|---|
| AUGUST | JANUARY |
| SEPTEMBER | FEBRUARY |
| OCTOBER | MARCH |
| NOVEMBER | APRIL |
| DECEMBER | MAY |

## UNIT II

## THE VOCATIONAL OPPORTUNITIES CLUBS OF TEXAS

### ASSIGNMENT SHEET 2--RECEIVING TRAVEL PERMISSION

Directions: Before a student is allowed to travel to events sponsored by the Vocational Opportunities Clubs of Texas (VOCT), the parents' permission form below should be filled out by the parent or guardian of each student.

Permission is hereby granted for ______________________________ to participate in activities in Building Maintenance including field trips, transportation to and from job sites, and any other activities sponsored by the Vocational Opportunities Clubs of Texas.

I hereby relieve the school of all responsibility in case of accident or bodily harm which might be incurred on these occasions.

_________________________ Date

_________________________ Parent or Guardian

# UNIT II

# YOUTH LEADERSHIP

## TEST--PART 1

1. Point out the purposes of the VOCT organization by placing a "✓" in front of each correct statement

    _____ a. To develop a respect for education through academic experiences coordinated with vocational skill development.

    _____ b. To promote an understanding and appreciation for the world of work

    _____ c. To develop leadership abilities

    _____ d. To get out of regular classroom studies

    _____ e. To develop the ability to organize activities by using the Democratic process

    _____ f. To further develop respect for all individuals

    _____ g. To motivate students through involvement in competition and club activities

    _____ h. To embarrass students in front of others

    _____ i. To develop pride in one's trade

2. Explain what each of the parts of the VOCT Creed means to you

    a. I believe in the worthiness of work and I will try my best to be a good worker

    b. I believe in freedom and the American way of life

    c. I believe in education and I will try to make the best use of the knowledge and skills that I learn

    d. I believe in being fair and honest

e. I believe that to gain respect for myself, I must be respectful of others

f. I believe satisfaction is gained from good work

3. Write the VOCT pledge from memory.

4. Explain the meaning of the VOCT motto:

"Preparing today for the world of work"

5. Point out the VOCT colors by circling three from the list below

| | |
|---|---|
| gold | red |
| blue | black |
| orange | violet |
| green | white |
| pink | tan |

6. Select the rules of the VOCT code of ethics from the list by placing a "✓" in front of each correct statement.

_____ a. Exercise proper respect for the rights of others

_____ b. Respect and obey only the school policies that are easy to follow

_____ c. Dress in a manner that is not accepted by others

_____ d. Take an active part in club work

_____ e. Uphold and practice the true meaning of the creed and pledge

_____ f. Cheat in all club-sponsored activities

_____ g. Strive for better health of body and mind

_____ h. Be industrious at school and at work so that a better knowledge of the chosen occupation might be obtained

_____ i. Practice the golden rule

7. Point out the meaning of each of the VOCT symbols by writing the number of the symbol in the correct blank at the left.

_____ a. Represents the principles of justice to all

_____ b. The five points represent the home, the school, industry, the community, and the state of Texas

_____ c. Represents the history of man

_____ d. Represents justice in the weighing of labor and its rewards

_____ e. Represents the passing of time and the necessary reporting of what we do

_____ f. Represents patriotism

_____ g. Represents safe keeping of club equipment and members

_____ h. Represents guidance to help club members obtain knowledge, gain experience, and develop skills

1. Key
2. Balance
3. Gavel
4. Triangle
5. Subscriber and tablet
6. Shield
7. Lone Star of Texas
8. Clock and pen

## UNIT II

## YOUTH LEADERSHIP

### TEST--PART 2

1. Identify the duties and symbols of the offices for VOCT by writing the name of each office and the numbers of the duties in the spaces provided.

Duties  Name of Office

_____ a.

_____ b.

_____ c.

_____ d.

_____ e.

_____ f.

_____ g.

_____ h.

(1) Advises the club officers on points of parliamentary procedure

(2) Receives and keeps chapter funds in a safe, businesslike manner

(3) Assists the president and takes responsibility for committees

(4) Takes care of all club publicity

(5) Arranges meeting room and cares for chapter equipment

(6) Assumes the responsibility of starting the chapter and giving advice concerning club business to the members

(7) Conducts meetings according to parliamentary procedure

(8) Prepares and reads minutes of meetings

2. Point out the things that make a good meeting by placing a "✓" in front of each correct statement.

_____ a. Careful planning in advance

_____ b. Starting and closing the meeting on time

_____ c. Keeping the business meeting slow and dull

_____ d. Trying a new order of business at each meeting

_____ e. Using no parliamentary procedure so things will be discussed openly

_____ f. Using the official opening and closing ceremonies

_____ g. Displaying chapter and officer banners

_____ h. Holding meetings in a comfortable place

_____ i. Including well-prepared committee reports

_____ j. Keeping most members from participating

_____ k. Having business with no entertainment

3. Point out the correct order of business by numbering the following items 1 through 7.

_____ a. Program (speakers)

_____ b. Closing ceremony

_____ c. Entertainment

_____ d. Opening ceremonies

_____ e. Special ceremonies (initiations)

_____ f. Reports

_____ g. Business

# UNIT II

# YOUTH LEADERSHIP

## TEST--PART 3

1. Point out the purposes of club activities by placing a "✓" in front of each correct statement below

   Club activities provide:

   _____ a. for the development of a spirit of cooperation

   _____ b. an understanding of competition

   _____ c. an opportunity to get out of classroom work

   _____ d. a recognition of social values

   _____ e. an ability to communicate

   _____ f. individual recognition

   _____ g. a way to get others to do all the work

2. Select the types of club activities by labeling each description with one choice from the list below.

   Vocational
   Civic
   Educational
   Recreational
   Social

   ______________________ a. Projects that produce good public relations and opinion within the community.

   ______________________ b. Activities that relate to the students career goals training.

   ______________________ c. Activities that provide body and mind building exercises.

   ______________________ d. Events that can help the student learn how to mix with and enjoy the company of other people.

   ______________________ e. Activities that relate to the skill training of the student.

3. List three reasons why a club should plan a yearly calendar.

   a.

   b.

   c.

4. Select the events that should be included on a club's yearly calendar by circling the letter in front of each correct statement listed below.

   a. All chapter functions

   b. Birthdates of your friends

   c. All contests

   d. Contests practice and preparation times

   e. Publicity deadlines

   f. Mickey Moore's birthday

   g. Room for alternate dates of special events

## UNIT II

## YOUTH LEADERSHIP

### ANSWERS TO TEST

Part 1

1. a. ✓
   b. ✓
   c. ✓
   d.
   e. ✓
   f. ✓
   g. ✓
   h.
   i. ✓
2. Evaluated to the satisfaction of the instructor.
3. Upon my honor, I will train myself through study and practice to become an honorable worker. I will uphold the ideals of my vocation and the Vocational Opportunities Clubs of Texas.
4. Evaluated to the satisfaction of the instructor.
5. red
   white
   blue
6. a. ✓
   b.
   c.
   d. ✓
   e. ✓
   f.
   g. ✓
   h. ✓
   i. ✓
7. a. 3
   b. 7
   c. 5
   d. 2
   e. 8
   f. 6
   g. 1
   h. 4

Part 2

1. 7 a. President
   3 b. Vice-President
   8 c. Secretary
   2 d. Treasurer
   4 e. Reporter
   1 f. Parliamentarian
   5 g. Sergeant-at-Arms
   6 h. Advisor
2. a. ✓
   b. ✓
   c.
   d.
   e.
   f. ✓
   g. ✓
   h. ✓
   i. ✓
   j.
   k.
3. a. 4
   b. 6
   c. 7
   d. 1
   e. 5
   f. 2
   g. 3

Part 3

1. a. ✓
   b. ✓
   c.
   d. ✓
   e. ✓
   f. ✓
   g.

2. a. Civic
   b. Educational
   c. Recreational
   d. Social
   e. Vocational

3. Answer should include three of the following five:
   a. All official chapter functions
   b. All contests
   c. Contest practice and preparation times
   d. Publicity deadlines
   e. Room for alternate dates of special events

4. a.
   c.
   d.
   e.
   g.

# UNIT III

## HUMAN RELATIONS IN THE SHOP

### UNIT OBJECTIVE

After completing this unit, the student will be able to determine the characteristics of a good personality, characteristics of a good co-worker, reasons why people work, and basic ways of getting along with people. This knowledge will be evidenced through demonstration and by satisfactorily completing the unit test.

### SPECIFIC OBJECTIVES

After completing this unit, the student will be able to:

1. Match the terms associated with human relations to the correct definition.
2. Point out the reasons for studying personalities.
3. Arrange in logical order the steps for improving your personality.
4. Select the characteristics of a good personality.
5. Select the characteristics of a good co-worker.
6. Select the personality traits that should be avoided.
7. Select the reason why people work.
8. Point out the reasons why most people lose their jobs.
9. List three ways people are different.
10. Select the basic ways of getting along with people.
11. Point out the factors to consider concerning human relations with co-workers.
12. Point out personality traits of individuals.

# UNIT III

# HUMAN RELATIONS IN THE SHOP

## SUGGESTED TEACHING ACTIVITIES

I. Objective sheet

  A. Discuss unit objectives with students

  B. Discuss each specific objective with students

  C. Have the students complete the objectives in the most logical sequence for the shop organization

  D. Add any necessary objectives

II. Information and assignment sheets

  A. Use this information in class discussion

  B. Have a guest speaker talk to the class about how personality and human relations can affect the individual on a job

  C. Use the following assignment sheets to reinforce this area of information:

    1. ASSIGNMENT SHEET 1--HUMAN RELATIONS WITH FELLOW WORKERS

      a. Emphasize that answers may vary so be able to explain your choice

      b. Discuss the answers with the class

      c. Have each student defend the answer given

    2. ASSIGNMENT SHEET 2--PERSONALITY RATING SHEET

      a. You may use two or more students to rate one individual

      b. Give each student a chance to rate and be rated

III. Transparency Master

TM-1--CONSTRUCTING JOB SUCCESS

IV. Answers to assignments

Answers to assignments will vary, however, class discussion is more important than correct answers

V. Evaluation

A. The evaluation may be used as an additional activity to reinforce the students'understanding of the information in this unit.

B. Add corresponding evaluation parts for any information sheets added to the unit.

VI. Answers to evaluation

A. Answers are based on the total information covered in the unit

B. For convenience of grading, make corresponding answer sheets for additional evaluation parts.

VII. References

A. Carlile, Robert. Agricultural Sales and Services. Columbia, Missouri: Instructional Materials Laboratory, University of Missouri, 1976.

B. Laird, Donald A. and others. Psychology, Human Relations and Motivation, 5th ed. New York: Gregg and Community College Division, McGraw-Hill Book Company, 1975.

C. Occupational Curriculum Laboratory. Instructor's Guide: An Introduction to Shop and Laboratory Teaching, 7th ed. Commerce, Texas: East Texas State University, 1977.

## UNIT III

## HUMAN RELATIONS IN THE SHOP

## INFORMATION SHEET

I. Terms and Definitions

   A. Human relations--Getting along with people and learning to accept them as they are

   B. Personality--All of a person's traits that are noticeable in an individual's behavior

   C. Attitude--Determines what one does and affects one's manner of behavior

   D. Respect--Giving consideration to people and their thoughts

   E. Service--Giving of one's self, talent, and abilities

   F. Trait--A quality or characteristic of an individual

II. Four reasons why we study personalities

   A. To understand ourselves

   B. To understand others

   C. To better live in our society

   D. To improve our personalities

III. Steps in improving your personality

   A. Decide that your personality can be improved

   B. Find out how your personality rates

   (NOTE: This can be done with the personality rating sheet in this unit.)

   C. Study this rating trait by trait

   D. Develop a plan of action

   E. Carry out your plan of action

IV. Characteristics of a good personality

  A. Cheerfulness

  B. Friendliness

  C. Forcefulness

  D. Self-confidence

  E. Tactfulness

V. Characteristics of a good fellow worker

  A. Following business rules and policies

  B. Respecting authority

  C. Carrying out assigned responsibilities

  D. Being able to go more than halfway

  E. Showing your interest by being bright-eyed and alert

  F. Showing your admiration and appreciation

  G. Making good use of constructive criticism

  H. Contributing new ideas

  I. Being honest

VI. Personality traits that should be avoided

  A. "Politicking"

  B. "Passing the buck"

  C. "Apple-polishing"

  D. "Clique forming"

  E. "Gossiping"

VII. Reasons why people work

  A. Satisfaction

  B. Support family

  C. Acceptance of peers

  D. Power

  E. Wealth
  F. Achieve goals

VIII. Reasons employees lose their jobs.

A. Unable to get along with fellow workers.

B. Poor attendance and too often late to work.

C. Abusing break times.

IX. Ways people are different.

A. Backgrounds

B. Attitudes

C. Abilities

X. Basic ways of getting along with people.

A. Keep skid chains on your tongue; always say less than you think.

(NOTE: Develop a low, persuasive voice. How you say something often counts far more than what you say.)

B. Make promises sparingly and keep them faithfully at any cost.

C. Never miss a chance to say something kind and encouraging to or about somebody.

(NOTE: Praise people for good work done, and if criticism is necessary, criticize constructively.)

D. Be interested in others.

(NOTE: Talk to others about their interests, their jobs, their homes, and families. Share others' happiness as well as their sadness. Let those you meet feel that you regard them as persons of importance.)

E. Be cheerful.

(NOTE: Keep the corners of your mouth turned up. Hide your pains, worries, and disappointments under a pleasant smile. Laugh at good stories and learn to tell them.)

F. Keep an open mind during all discussions.

(NOTE: Discuss but don't argue. It is a mark of intelligence to disagree and yet be friendly.)

G. Let your strengths speak for themselves, and refuse to talk of another's faults.

H. Be careful of others' feelings.

(NOTE: Wit and humor at the other fellow's expense are rarely worth the effort, and may cause hurt where it is least expected.)

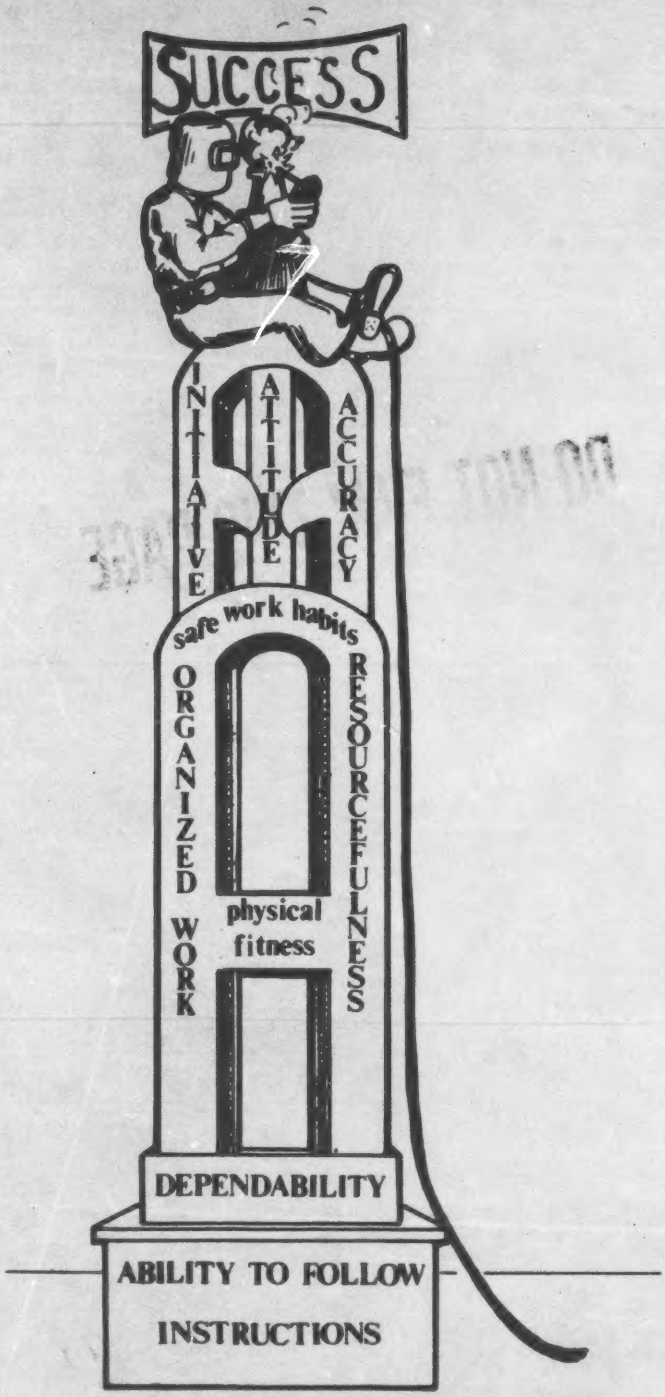
I. Pay no attention to ill-natured remarks about you.

(NOTE: Simply live so nobody will believe them.)

J. Do not be too anxious about getting praise.

(NOTE: Do your work, be patient, keep yourself honest, forget self, and you will be respected and rewarded.)

# CONSTRUCTING JOB SUCCESS


SUCCESS
INITIATIVE
ATTITUDE
ACCURACY
safe work habits
ORGANIZED WORK
RESOURCEFULNESS
physical fitness
DEPENDABILITY
ABILITY TO FOLLOW INSTRUCTIONS

## UNIT III

## HUMAN RELATIONS IN THE SHOP

### ASSIGNMENT SHEET 1--HUMAN RELATIONS WITH FELLOW WORKERS

Directions: Choose the answer you feel is correct for each of the following questions. Place your selection in the blank at the left. Orally discuss those about which you may have any questions.

_____1. Many occupations deal primarily with machines, equipment, or paper work; that is, they deal with things. In industry, however, most of the jobs involve close contact with:

a. employers
b. supervisors
c. people
d. other workers

_____2. For the most part, people are very much:

a. different
b. alike
c. it is difficult to say

_____3. It is possible that the things which you enjoy may:

a. appeal to others
b. not appeal to others
c. be distasteful to others
d. all of the above

_____4. Which of the following do most people have in common?

a. right to work at a job of their choice
b. desire to get ahead
c. desire to be accepted and approved
d. all of these
e. none of these

_____5. The best way to achieve your goals in life is to follow your rights and desires and:

a. also the wish of your boss
b. what your parents say
c. do unto others as you would have them do unto you
d. do just what you feel like doing

_____6. Do the best work you can for the important jobs and:

a. don't worry about the little jobs
b. let others do the little jobs
c. also do the most routine jobs
d. everything else will take care of itself

_____7. Plus doing the best work you can, it is important to:

a. learn as much as you can about your company
b. see what you can get on your boss
c. keep up on the latest gossip
d. be seen and not heard

_____8. The right to think and act as individuals

a. is not normally shared by most.
b. may be normally shared by most.
c. is normally shared by most.

_____9. You should "sell" your abilities on the job by telling everyone how well you do everything

a. not true
b. only part true
c. all true

_____10. Which of the following is not a desirable trait of an employee?

a. sense of humor
b. tact
c. indifference
d. initiative

_____11. Using others for our own benefit is:

a. desirable
b. OK if you can get away with it
c. undesirable
d. not too bad

_____12. When you are criticized by your superior, it is best to:

a. act indifferent
b. tell that person to do it
c. take it constructively
d. shrug it off

_____13. Loyalty includes:

a. working hours only
b. both the time to and from work
c. all the time
d. just when you feel like it

_____14. To approach your job with enthusiasm, it is necessary to:

a. fool the boss
b. impress your co-workers
c. be glad to be part of the team

_____15. It is not necessary to be friendly as long as you:

a. do your job
b. act as though you are
c. get to work on time
d. none of these

_____16. When you have a question, it is best to:

a. do the job the way you think it should be done
b. wait and ask it later
c. not bother your boss with it
d. ask it when it comes up

_____17. When you have joined a clique, you have:

a. picked sides
b. helped yourself
c. joined the "in" group
d. become a member of the team

_____18. A good way to get along in your new job is to:

a. be a "know-it-all"
b. be willing to learn
c. show your co-workers how smart you are
d. run to your boss with every question you have

_____19. Showing that you are not afraid of work means to:

a. work as hard as you can
b. be willing to tackle any job assigned
c. work harder than any of your co-workers

_____20. The need to show appreciation to fellow workers:

a. will get you nowhere
b. is strongest when you are new
c. isn't really necessary at all
d. is just on the surface

_____21. You should start calling your co-workers by their:

a. first names as soon as possible
b. nicknames to show you are really in
c. last names only
d. proper names until you have been around awhile or told differently

_____22. If you do all of the things we have suggested, you will have:

a. everyone liking you
b. a few things
c. a better chance of being well-liked
d. the reputation for being an apple-polisher

_____23. The people you can learn the most from are:

a. always your bosses
b. your best buddies
c. those who show an interest in you
d. the ones with whom you eat lunch

_____24. Human behavior is usually

a. pretty easy to understand
b. not easy to predict
c. easy to predict
d. none of your business

## UNIT III

## HUMAN RELATIONS IN THE SHOP

### ASSIGNMENT SHEET 2--PERSONALITY RATING SHEET

Directions: Be as sincere as possible and rate a fellow student by placing a "√" in the blank you think best. Remember, you are helping your friends. Do not let your writing or anything give away your identify as the rater. Hand back the completed rating to your instructor so ratings may be passed on to the student being rated.

NAME OF STUDENT BEING RATED ______________________________

| Traits | Very Good | Above Average | Average | Below Average | Poor |
|---|---|---|---|---|---|
| 1. Posture | ______ | ______ | ______ | ______ | ______ |
| 2. Expressions | ______ | ______ | ______ | ______ | ______ |
| 3. Health | ______ | ______ | ______ | ______ | ______ |
| 4. Grooming | ______ | ______ | ______ | ______ | ______ |
| 5. Dress | ______ | ______ | ______ | ______ | ______ |
| 6. Mannerisms | ______ | ______ | ______ | ______ | ______ |
| 7. Speech | ______ | ______ | ______ | ______ | ______ |
| 8. Body movements | ______ | ______ | ______ | ______ | ______ |
| 9. Intelligence | ______ | ______ | ______ | ______ | ______ |
| 10. Initiative | ______ | ______ | ______ | ______ | ______ |
| 11. Industry | ______ | ______ | ______ | ______ | ______ |
| 12. Dependability | ______ | ______ | ______ | ______ | ______ |
| 13. Enthusiasm | ______ | ______ | ______ | ______ | ______ |

| | Traits | Very Good | Above Average | Average | Below Average | Poor |
|---|---|---|---|---|---|---|
| 14. | Sincere interest in others | | | | | |
| 15. | Honesty | | | | | |
| 16. | Courtesy | | | | | |
| 17. | Manners | | | | | |
| 18. | Respect for others | | | | | |
| 19. | Emotional control | | | | | |
| 20. | Self-confidence | | | | | |
| 21. | Moral values | | | | | |
| 22. | Loyalty | | | | | |
| 23. | Desire to work | | | | | |
| 24. | Acceptance of change | | | | | |
| 25. | Ability to decide | | | | | |
| 26. | Ability to accept criticism | | | | | |
| 27. | Tact | | | | | |
| 28. | Cheerfulness | | | | | |
| 29. | Alertness | | | | | |
| 30. | General knowledge | | | | | |
| 31. | Willingness to help | | | | | |
| 32. | Shows initiative | | | | | |
| 33. | Accepts duites | | | | | |
| 34. | Expresses other interest | | | | | |
| 35. | Maturity | | | | | |

# UNIT III

# HUMAN RELATIONS IN THE SHOP

## ANSWERS TO ASSIGNMENT SHEET

Assignment Sheet 1

Answers may vary, but a good discussion is more important than having the correct answers on the quiz.

1. d There is contact with all of these groups, but the close contact is with other workers.
2. b This is a generalization, but all people like to be treated with respect, considered important, treated fairly.
3. d All three of these apply--it could be any of these.
4. d These are important traits for achieving success in life.
5. c Do unto others as you would have them do unto you.
6. c
7. a
8. c
9. b You should sell your abilities by doing not telling. If you show your ability to do a good job, you won't have to tell anyone.
10. c
11. c
12. c
13. c
14. c
15. d

16. d
17. a
18. b
19. b
20. b
21. d This is part of respect
22. c
23. c
24. a

Assignment Sheet 2

Have students hand in rating sheets and return them to each student rated. This may be done several times, rating different students each time.

## UNIT III

## HUMAN RELATIONS IN THE SHOP

## TEST

1. Match the terms associated with human relations to the correct definitions by placing the number of each term in the blanks provided.

_____ a. Getting along with people and learning to accept them as they are.

_____ b. All of a person's traits that are noticeable in an individual's behavior.

_____ c. Determines what one does and affects one's manner of behavior.

_____ d. Giving consideration to people and their thoughts.

_____ e. Giving of one's self, talent, and abilities.

_____ f. A quality or characteristic of an individual.

1. Personality
2. Service
3. Human relations
4. Respect
5. Attitude
6. Trait

2. Point out the reasons we study personality by answering yes or no to each of the following statements.

_____ a. to understand ourselves

_____ b. to kill time

_____ c. To point out a person's bad traits

_____ d. To understand others

_____ e. To better live in our society

_____ f. To improve our personalities

3. Arrange in logical order steps in improving your personality. Number the correct order with 1 through 5.

_____ a. Study this rating trait by trait.

_____ b. Decide that your personality can be improved.

_____ c. Carry out your plan of action.

_____ d. Find out how your personality rates.

_____ e. Develop a plan of action.

4. Select the characteristics of a good personality by placing a "✓" in the blank next to good characteristics.

_____ a. Cheerfulness

_____ b. Spitefulness

_____ c. Self-confidence

_____ d. Tactfulness

_____ e. Conceited

_____ f. Forcefulness

5. Select the characteristics of a good fellow worker by placing a "✓" in the correct blanks.

_____ a. Carrying out assigned responsibilities

_____ b. Criticizing company policy

_____ c. Doing only the work assigned to you

_____ d. Contributing new ideas

_____ e. Following business rules and policies

_____ f. Respect for authority

_____ g. Being critical of new ideas

6. Select the personality traits that should be avoided by placing a "✓" in the correct blanks:

_____ a. Passing the buck

_____ b. Dedication

_____ c. Loyalty

_____ d. Gossiping

_____ e. Apple-polishing

7. Select the reasons why people work by placing a "✓" in the correct blanks.

_____ a. For personal satisfaction

_____ b. To support a family

_____ c. To achieve goals

_____ d. To get out of the house

_____ e. For acceptance of peers

_____ f. For power

_____ g. To decrease welfare rolls

_____ h. For wealth

8. Point out the reasons why most employees lose their jobs by answering true or false to each of the following statements.

_____ a. Working too hard

_____ b. Unable to get along with fellow workers

_____ c. Poor attendance and too often late to work

_____ d. Trying to advance

_____ e. Abusing break times

9. List three ways people are different.

a.

b.

c.

10. Select the basic ways of getting along with people by placing a "✓" in the correct blanks.

_____ a. Be cheerful

_____ b. Complain often

_____ c. Talk about co-workers behind their back

_____ d. Keep an open mind during all discussions

_____ e. Be careful of others' feelings

_____ f. Voice your opinions often

_____ g. Tell others of your strengths and point our their faults

_____ h. Be interested in others

_____ i. Keep only the promises that are easily kept

# UNIT III

# HUMAN RELATIONS IN THE SHOP

## Answers to Test

1. a. 3
b. 1
c. 5
d. 4
e. 2
f. 6

2. a. yes
b. no
c. no
d. yes
e. yes
f. yes

3. a. 3
b. 1
c. 5
d. 2
e. 4

4. a. ✓
b.
c. ✓
d. ✓
e.
f. ✓

5. a. ✓
b.
c.
d. ✓
e. ✓
f. ✓
g.

6. a. ✓
b.
c.
d. ✓
e. ✓
f.

7. a. ✓
b. ✓
c. ✓
d.
e. ✓
f. ✓
g.
h. ✓

8. a. false
b. true
c. true
d. false
e. true

9. a. backgrounds
b. attitudes
c. abilities

10. a. ✓
b.
c.
d. ✓
e. ✓
f.
g.
h. ✓
i.

# UNIT IV

## GROOMING AND HYGIENE

### UNIT OBJECTIVE

After completing this unit, the student will be able to identify terms and habits on grooming and personal hygiene, describe clothing appropriate for leisure wear and work, analyze grooming habits, and plan and select proper clothing. This knowledge will be evidenced through demonstration and by satisfactorily completing a unit test.

### SPECIFIC OBJECTIVES

After completing this unit, the student will be able to:

1. Match terms associated with grooming and hygiene with their proper definitions.
2. Select good grooming habits.
3. Point out the things to consider when selecting clothing.
4. Point out the types of foods and recommended daily servings for teenagers for each of the basic food groups.
5. Point out good sleeping habits.
6. Analyze personal grooming habits.
7. Construct posters representing food groups, proper dress, and personal hygiene.
8. Plan and select the clothing required for a week.

# UNIT IV

## GROOMING AND HYGIENE

## SUGGESTED TEACHING PROCEDURES

I. Objective sheet

   A. Discuss the unit objective with the students.

   B. Discuss each specific objective with the students.

   C. Have the students complete the objectives in the most logical sequence for shop organization.

   D. Add any objectives necessary.

II. Information and assignment sheets

   A. Use this information sheet for general discussion classes.

   B. Add specific shop requirements to the information.

   C. Have a guest speaker discuss the ways proper grooming and hygiene can help a person on a job.

   D. Use the following assignment sheets to reinforce this area of information:

      1. ASSIGNMENT SHEET 1--GROOMING SELF-ANALYSIS

         a. This activity may be given orally to the class.

         b. Discuss each of the questions after each student has completed a self-rating.

      2. ASSIGNMENT SHEET 2--HYGIENE, GROOMING AND FOODS

         a. Display the posters in class.

         b. Have students select the best illustrated idea.

      3. ASSIGNMENT SHEET 3--CLOTHING SELECTION

         a. Provide clothing catalogues for the students to make their selections from.

         b. Have each student explain the selection.

III. Transparency Masters

   (NOTE: Transparency masters are included in student manuals and may be used as information sheets.)

   A. TM-1--HOW SHOULD YOU PREPARE FOR WORK?

   B. TM-2--LET'S IMPROVE OUR LOOKS

C. TM-3--PERSONAL PRIDE

D. TM-4--BASIC FOOD GROUPS

IV. Test

A. The test may be used as an additional activity to reinforce the students understanding of the information in this unit.

B. Add corresponding test parts for any information sheets added to the unit.

V. Answers to test

A. Answers are based on the total information covered in the unit.

B. For convenience of grading, make corresponding answer sheets for additional test parts.

VI. References

A. About Her. Dallas: Gregg Division, McGraw-Hill Book Company, 1968.

B. About Him. Dallas: Gregg Division, McGraw-Hill Book Company, 1968.

C. Curriculum and Instructional Materials Center. Cooperative Office Education. Stillwater, Oklahoma: Oklahoma State Board for Vocational and Technical Education, 1973.

D. Laird, Donald A. and others. Psychology: Human Relations and Motivation. 5th ed. Dallas: Gregg and Community College Division, McGraw-Hill Book Company, 1975.

E. Russon, Allien R. Personality Development for Business. 4th ed. Cincinnati: South-Western Publishing Company, 1973.

VII. Training Aids

A. "We're Only Human" - 16mm Film--Available from Motion Talking Picture Service, 4084 Westheimer Road, Houston, Texas 77027.

B. "Fashion Designs on You"--16mm Film--Available from American Sheep Producers Council, Department C.O., 200 Clayton Street Denver, Colorado.

C. "The Beauty of You"--16mm Film--Available from Association-Sterling Films, 8615 Directors Row, Dallas, Texas, 75427.

D. "Nutrition Is"--16mm Film--Available from West Glen Films, 565 Fifth Avenue, New York, New York, 10017.

## UNIT IV

## GROOMING AND HYGIENE

## INFORMATION SHEET

I. Terms and Definitions

   A. Accessories--Jewelry and additional clothing items which add attractiveness to basic clothing apparel

   B. Acne--Skin disease common with teenagers

   C. Adaptable--The ability to adjust to various situations

   D. Allergies--Bodily reactions to various food, fibers, etc.

   E. Antiperspirant--Preparation that keeps underarms dry and odor-free

   F. Astringents--Lotions containing some alcohol which are usually patted on the face

   G. Comparison--Looking at different things and describing how they're similar or different

   H. Compliment--Words of praise or approval

   I. Conspicuous--Something that is obvious, noticeable, and often not in good taste

   J. Cosmetics--Beauty-aid products

   K. Cuticle--Thin dead skin at the sides and base of a fingernail or toenail

   L. Fatigue--Being tired

   M. Immaculate--Spotlessly clean

   N. Lotion--A substance used to make the skin smooth and soft

   O. Manicure--To file and buff nails and to trim cuticles

   P. Schedule--A timetable of activities

II. Grooming Habits

   A. Good health

      1. Bathe daily.

      2. Exercise regularly.

    3. Get sufficient sleep.
    4. Brush teeth (as often as possible.)
    5. Eat regular meals.

  B. Appearance
    1. Shave as often as required.
    2. Clean and manicure nails.
    3. Brush hair into an attractive style.
    4. Use a deodorant or antiperspirant.
    5. Shampoo hair as needed.
    6. Wear appropriate clothing.
    7. Practice good posture.

III. Clothing Selection

  A. Clothing should be practical for the wearer, which includes easy care.

  B. When selecting new items, the buyer should consider:
    1. Fit and comfort
    2. Suitability to place to be worn
    3. Personality
    4. Figure problems
    5. Price of items and one's clothing budget
    6. Workmanship
    7. Fabric type and upkeep
    8. Color, line, and style
    9. Life expectancy
    10. How it would go with other clothing

  C. Clothing for work must be
    1. Comfortable
    2. Durable
    3. Safe

4. Suitable and well-fitting

5. Easily kept clean

D. Clothing does not have to be new to be clean, well-fitting, or suitable for work.

IV. Eating Proper Foods

A. To look trim and alert, individuals should keep their weight according to their body structure.

B. Select from all basic food groups each day

1. Milk--Includes cheese, ice cream, and other milk-made foods

2. Meat-Includes meats, fish, and poultry

3. Vegetables and fruits--Includes dark green and yellow vegetables, citrus fruit or tomatoes

4. Breads and cereals--Includes grain products

C. Recommended servings for teenagers

1. Milk--Four servings

2. Meat--Two or more servings

3. Vegetables and fruits--Four or more servings

4. Breads and cereals--Four servings

D. Proper foods, along with proper sleep and exercise, produce a good complexion, shiny hair, a glowing appearance, and plenty of energy.

V. Good sleeping habits

A. Get some exercise every day.

B. Avoid foods which are hard to digest.

C. Follow a schedule to get to bed at the same time every night.

D. Avoid excitement before bedtime.

E. Avoid worrying when getting to bed.

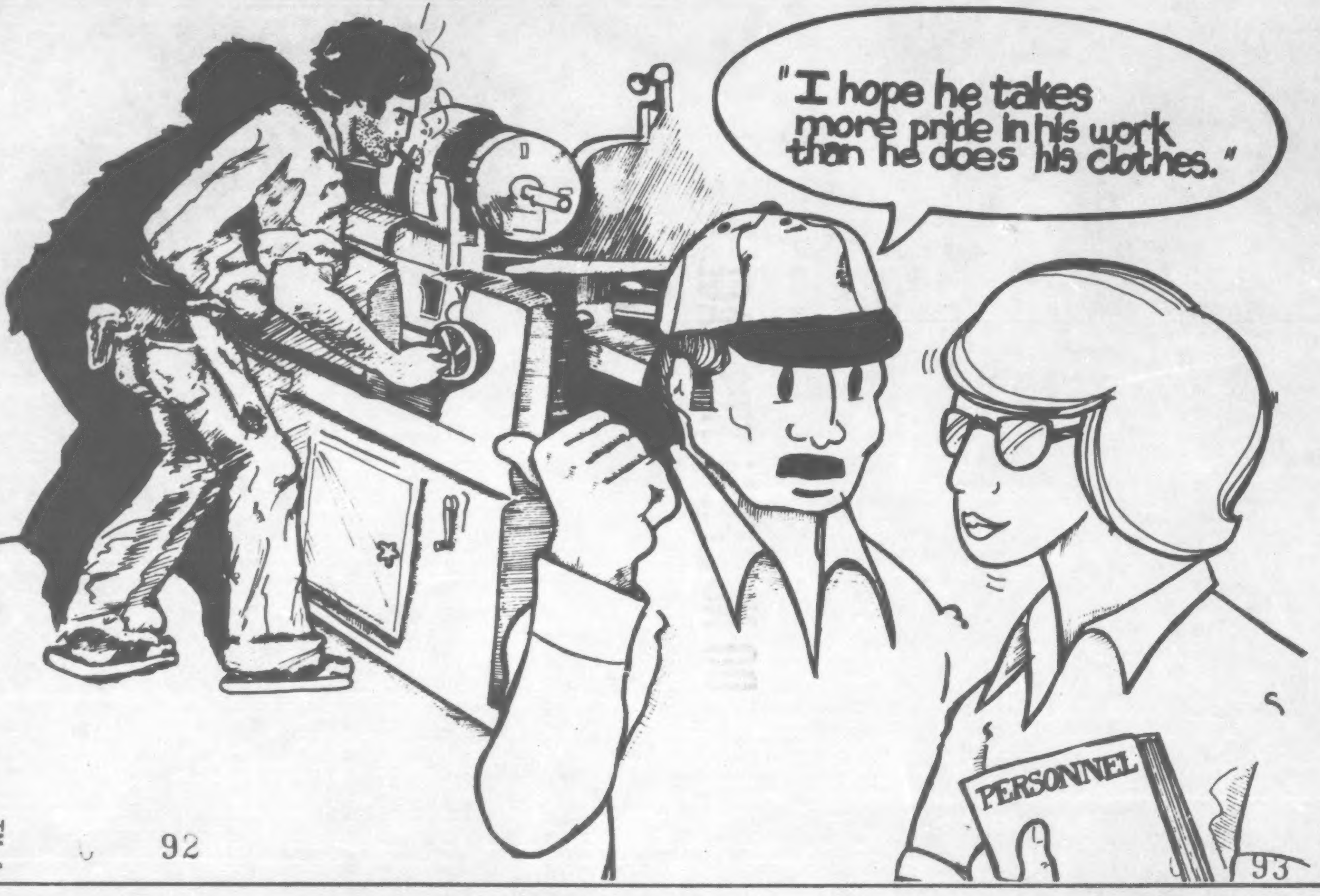
F. Make sure bed covering is adequate.

G. Wear comfortable sleep wear.

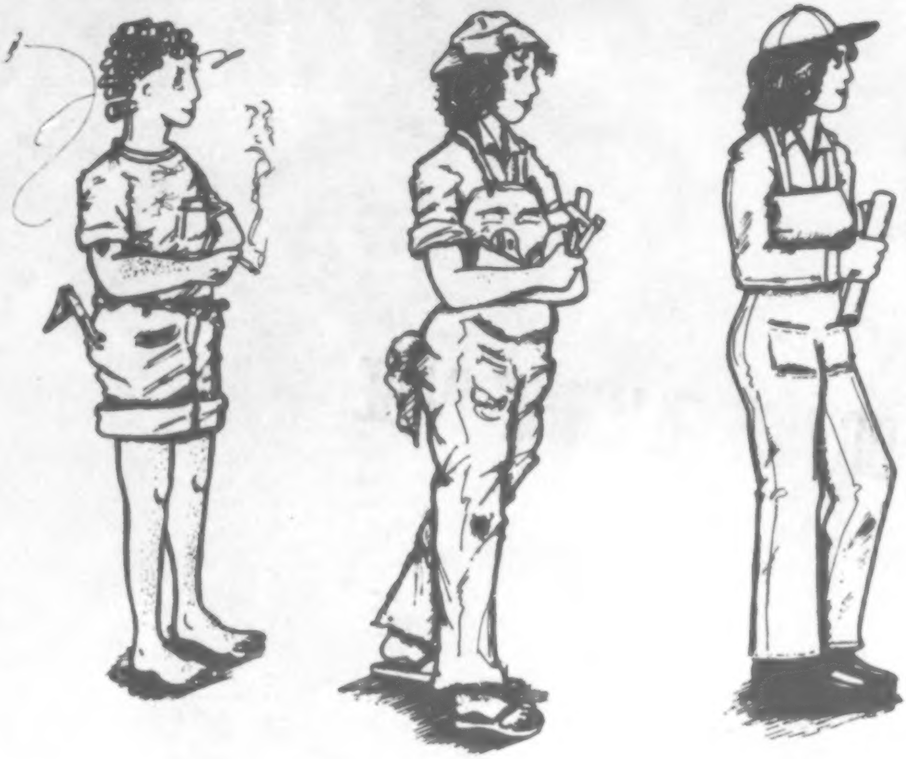
H. Make sure room is properly ventilated.

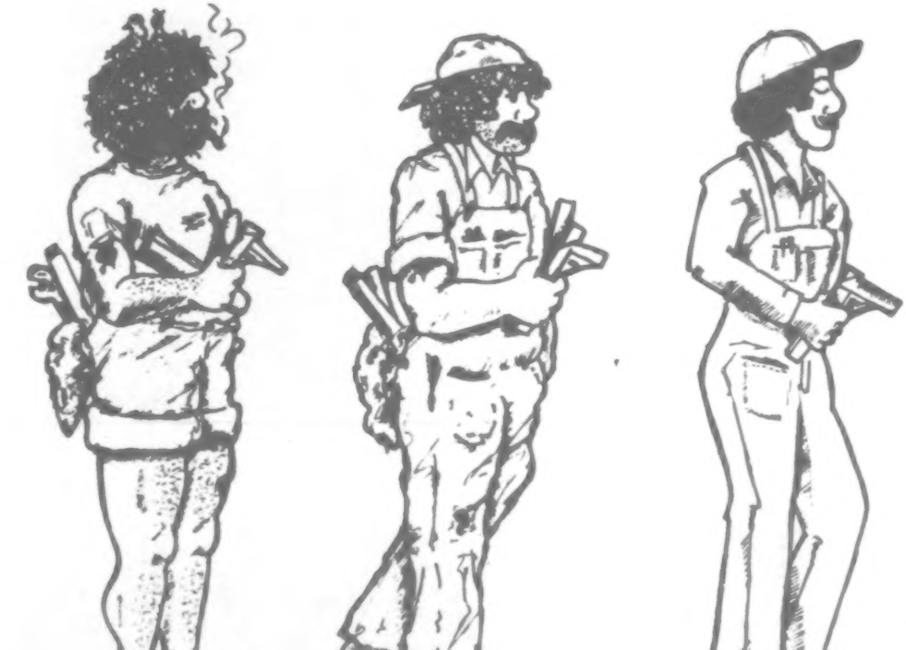
I. Darken room and shut out noises.

# HOW SHOULD YOU PREPARE FOR WORK?

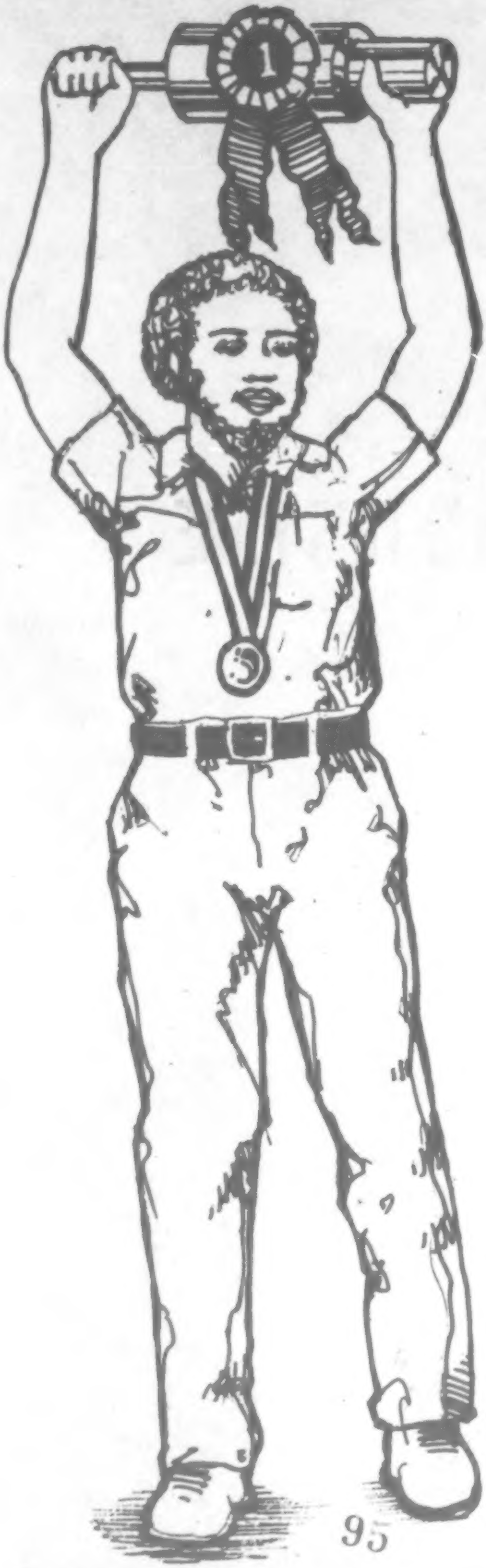

"I hope he takes more pride in his work than he does his clothes."
PERSONNEL

# LET'S IMPROVE OUR LOOKS

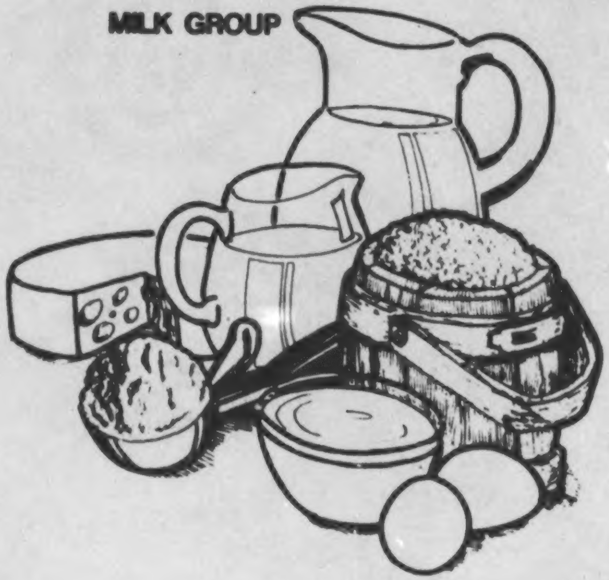




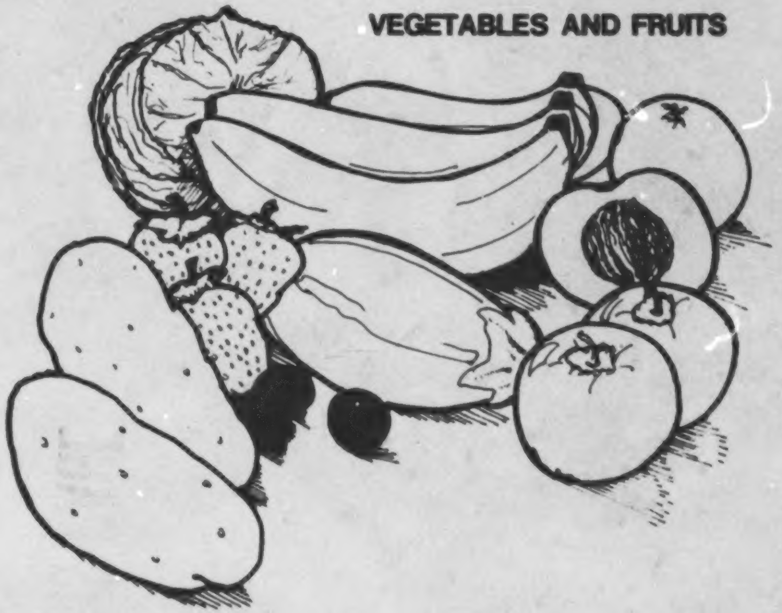
# PERSONAL PRIDE



MILK GROUP

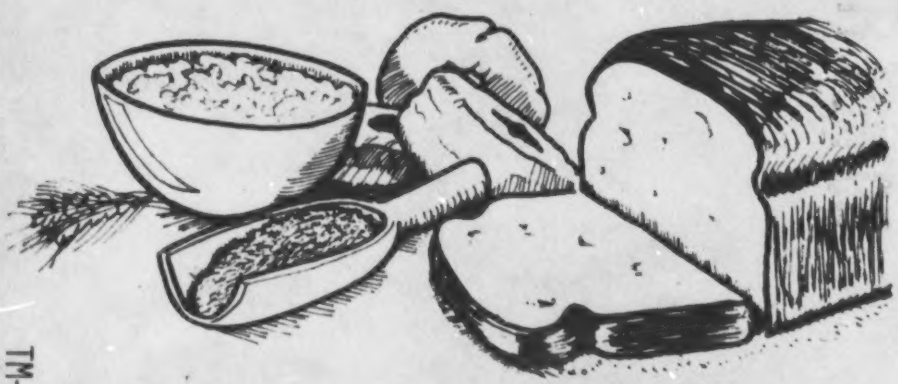


VEGETABLES AND FRUITS

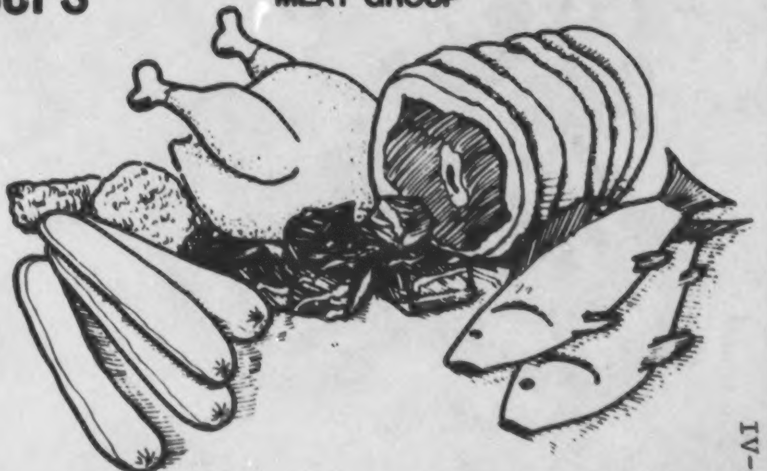


# BASIC FOOD GROUPS

BREADS AND CEREALS



MEAT GROUP



## UNIT IV

## GROOMING AND HYGIENE

### ASSIGNMENT SHEET 1--GROOMING SELF-ANALYSIS

Directions: Rate yourself on each of the following questions, using a scale of "6"-Always, "4"-Usually, "2"-Occasionally, and "0"-Never. When you have completed the evaluation, add your score and compare it to the rating scale provided.

QUESTIONS RATING

1. Do you take a bath or shower daily? ______
2. Do you use an effective deodorant or antiperspirant daily? ______
3. Do you use a foot spray or powder daily? ______
4. Do you shave as often as needed? ______
5. Do you put on clean clothes daily? ______
6. Do you put on clean socks or hose daily? ______
7. Do you clean your face thoroughly at least twice a day (more often if you have oily skin)? ______
8. Do you use soap when you wash your hands? ______
9. Do you clean fingernails daily? ______
10. Do you wash your hands before meals and after using the bathroom? ______
11. Do you wash your hair as often as needed? ______
12. Do you observe your shop's rules about hair? ______
13. Do you have hair cut or trimmed regularly? ______
14. Do you use a dandruff shampoo and/or cream rinses and conditioner if needed? ______
15. Do you brush your teeth at least twice daily? ______
16. Do you use a mouthwash daily? ______
17. Do you get enough sleep and rest so that you feel refreshed? ______

Rating

18. Do you take a good look at yourself in a full mirror before leaving the house? ______

19. Do you take a few minutes during the day to freshen your looks and comb your hair? ______

20. Do you use breath fresheners during the day or after eating foods with unpleasant odors? ______

TOTAL ____________

Rating:

| | |
|---|---|
| 104 - 120 | You take pride in your appearance. |
| 88 - 103 | You'd probably pass inspection. |
| 73 - 87 | You're not really trying. |
| Less than 73 | Your best friend won't even tell you. |

# UNIT IV

# GROOMING AND HYGIENE

## ASSIGNMENT SHEET 2--HYGIENE, GROOMING AND FOODS

Directions: Select one of the following topics to use in constructing a poster.

1. Food groups and examples of each
2. Proper and improper dress
3. Proper hygiene and grooming habits
4. Shop dress
5. Shop cleanliness
6. How do others see me?
7. Steps to improve my looks
8. Clothing styles
9. Selecting my clothing
10. Taking care of my clothes

## UNIT IV

## GROOMING AND HYGIENE

### ASSIGNMENT SHEET 3--CLOTHING SELECTION

Directions: Using a specified amount of money, plan your clothing for a week using one or more department store catalogs. This clothing should include both leisure time and work wear. Make sure the clothing does not cost more than the amount of money budgeted.

Suggestion: You may want to use an amount that would be a week's salary for a worker.

## UNIT IV

## GROOMING AND HYGIENE

## TEST

1. Match the terms on the right to their correct definition by placing the correct number in the blank provided.

_____ a. A timetable of activities

_____ b. Beauty-aid products

_____ c. Words of praise or approval

_____ d. Bodily reactions to various foods, fibers, etc.

_____ e. Jewelry and additional clothing items

_____ f. Being tired

_____ g. Spotlessly clean

_____ h. To file and buff nails and to trim cuticles

_____ i. Skin disease common with teenagers

_____ j. A substance used to make smin smooth and soft

_____ k. Looking at different things and describing how they are similar or different

_____ l. Preparation that keeps the underarms dry and odor-free

_____ m. Thin dead skin at the sides of a fingernail or toenail

_____ n. The ability to adjust to various situations

_____ o. Lotions containing some alcohol which usually are patted on the face

_____ p. Something that is obvious, noticeable, and usually not in good taste

1. Accessories
2. Acne
3. Adaptable
4. Allergies
5. Antiperspirant
6. Astringents
7. Comparison
8. Compliment
9. Conspicuous
10. Cosmetics
11. Cuticle
12. Fatigue
13. Immaculate
14. Lotion
15. Manicure
16. Schedule

2. Select the good grooming habits by circling the letter of each correct answer.

   a. Bathe weekly.

   b. Exercise regularly.

   c. Get sufficient sleep.

   d. Brush teeth seldom.

   e. Eat regular meals.

   f. Shave as often as required.

   g. Clean and manicure nails.

   h. Do not brush hair.

   i. Use deodorant or antiperspirant.

   j. Shampoo hair as needed.

   k. Wear extreme clothing styles.

   l. Practice good posture.

3. Point out the things to consider when selecting clothing by circling the letter of each correct answer.

   a. Clothing should be practical and easy to care for.

   b. Fit and comfort

   c. Wild styles

   d. One's personality

   e. Figure problems

   f. Most expensive items

   g. First impression of item

   h. Fabric type and upkeep

   i. Color line and style

   j. Life expectancy of item

   k. Is it different from other clothing?

   l. Is the clothing safe to wear for work?

   m. Is the clothing clean, well-fitting, and suitable for work?

4. Point out the types of foods and recommended daily servings for teenagers for each of the basic food groups. Choose the correct answers from the list below. Use the same answer as many times as necessary.

| Foods Choice | Servings Choice |
|---|---|
| Cheese and other dairy products | One serving |
| Beef, fish, and poultry | Two servings |
| Beans, tomatoes, and oranges | Three servings |
| Grain products | Four servings |

| Food | Serving |
|---|---|
| a. Vegetables and fruits - | - |
| b. Meats - | - |
| c. Breads and cereals - | - |
| d. Milk - | - |

5. Point out the good sleeping habits by placing a "✓" in front of each correct answer below.

_____ a. Exercise daily.

_____ b. Eat plenty of food late in the evening.

_____ c. Go to bed at different times each night.

_____ d. Plan an exciting evening before bedtime.

_____ e. Avoid worrying when getting to bed.

_____ f. Make sure you get plenty rest.

_____ g. Wear comfortable sleepwear.

_____ h. Make sure the room is well ventilated.

_____ i. Leave the room light on and the door open.

## UNIT IV

## GROOMING AND HYGIENE

### ANSWERS TO TEST

1. a. 16
   b. 10
   c. 8
   d. 4
   e. 1
   f. 12
   g. 13
   h. 15
   i. 2
   j. 14
   k. 7
   l. 5
   m. 11
   n. 3
   o. 6
   p. 9

2. b.
   c.
   e.
   f.
   g.
   i.
   j.
   l.

3. a.
   b.
   d.
   e.
   h.
   i.
   j.
   l.
   m.

4. a. Beans, tomatoes, and oranges - Four servings
   b. Beef, fish, and poultry - Two servings
   c. Grain products - Four servings
   d. Cheese and other dairy products - Four servings

5. a. ✓
   b.
   c.
   d.
   e. ✓
   f. ✓
   g. ✓
   h. ✓

# UNIT V

## JOB APPLICATION AND INTERVIEW

### UNIT OBJECTIVE

After completing this unit of instruction, the student will be able to identify terms, definitions, and procedures involved in job applications and interviews. The student will also prepare a résumé, write a letter of application for employment, complete an employment application form, and in role-playing situations demonstrate the ability to call for an interview appointment and participate in an interview. This knowledge will be evidenced by demonstration and by satisfactorily completing a unit test.

### SPECIFIC OBJECTIVES

After completing this unit of instruction, the student will be able to:

1. Identify terms relating to job application and interview with their correct definitions.
2. Point out items of information to be included on a résumé.
3. List the two methods of applying for a job.
4. Identify examples of proper dress and grooming for an interview.
5. Select the correct ways to prepare for an interview.
6. Point out the proper conduct during an interview.
7. Select the positive attitudes an employer looks for during an interview.
8. Name the reasons one may not get a job after an interview.
9. Demonstrate the ability to:
    a. Write a letter of application for employment.
    b. Role-play, making an interview appointment by phone.
    c. Prepare and write a résumé.
    d. Answer questions an employer may ask during an interview.
    e. Complete an employment application form.
    f. Point out the do's and don'ts of an interview.
    g. Participate in and evaluate a role-played job interview.
    h. Write a follow-up letter.

## UNIT V

## JOB APPLICATION AND INTERVIEW

### SUGGESTED TEACHING ACTIVITIES

I. Objective sheet

  A. Discuss unit objectives with students

  B. Discuss each specific objective with students

  C. Have the students complete the objectives in the most logical sequence for the shop organization.

  D. Add any necessary objectives.

II. Information and assignment sheets

  (NOTE: This unit may be more appropriate for teaching close to the end of the year.)

  A. INFORMATION SHEET 1--PREPARING FOR THE APPLICATION

    1. Provide local sources of job opportunity notices.

       (Transparency 1--HOW TO FIND A JOB)

    2. Discuss local requirements in applying for a job.

    3. Have the students to complete the following assignment sheets to reinforce this area of information.

      a. ASSIGNMENT SHEET 1--WRITING A LETTER OF APPLICATION FOR EMPLOYMENT

        (1) Have students write sample letters to shops of their choice.

        (2) Discuss what should and should not be included in the letters.

      b. ASSIGNMENT SHEET 2--MAKING AN APPOINTMENT BY PHONE

        (1) The students in class may check each student's handling of the simulated situation.

        (2) Have several students role-play the simulated situation to provide a variety of questions.

      c. ASSIGNMENT SHEET 3--PREPARING AND WRITING A RÉSUMÉ

        (1) Assist the students with key information for a résumé.

(2) Have the business or office occupations classes type the resume for the students' notebooks.

(3) Encourage students to update their résumés as they work in different places

B. INFORMATION SHEET 2--THE INTERVIEW

1. Discuss the types of clothes that would be appropriate for various local industries.

2. Have a personnel manager from local industry come and talk to the class.

3. Have the students to complete the following assignment sheets to reinforce this area of information.

   a. ASSIGNMENT SHEET 4--QUESTIONS THE EMPLOYER MAY ASK

      (1) This activity may be given orally to the class.

      (2) Have the class brainstorm other questions that they may be asked.

   b. ASSIGNMENT SHEET 5--COMPLETING AN EMPLOYMENT APPLICATION FORM

      (1) Application forms from the VOCT Competitive Activities Guide may be used.

      (2) Provide examples of other application forms from local businesses.

   c. ASSIGNMENT SHEET 6--THE DO'S AND DON'TS OF THE INTERVIEW

      (1) Add any other important rules relating to the interview.

      (2) Discuss the reasons for each answer.

   d. ASSIGNMENT SHEET 7--EVALUATING THE JOB INTERVIEW

      (1) Have the class evaluate the student in the interview.

      (2) Have several students participate in the activity.

   e. ASSIGNMENT SHEET 8--WRITING A FOLLOW-UP LETTER

      (1) Assist the students in preparing a sample follow-up letter.

      (2) Discuss the importance of such a letter and its content.

III. Transparency masters

(NOTE: Transparency masters are included in student manuals and may be used as information sheets.)

A. TM-1--HOW TO FIND A JOB

B. TM-2--HOW TO GET A JOB APPLICATION FORM

IV. Answers to assignment sheets

A. Some answers will vary, but a discussion is more important than looking for specific answers.

B. Have students make corrections and place the assignments in their notebooks for later reference.

V. Test

A. The test is divided into two parts.

(NOTE: Each part covers one information sheet)

B. Various approaches may be used in testing:

1. Give each part of the evaluation after the student has completed studying the information on one information sheet.

2. Give the entire test upon completion of all the information sheets in a unit.

3. Give one or more parts of the test as an additional assignment or to reinforce problem areas of learning.

C. Include evaluation parts corresponding to any information sheets added to the unit.

VI. Answers to the test

A. Answers are based on the total information covered in the unit.

B. For convenience in grading, make corresponding answer sheets for any test parts added.

VII. References

A. Andrew, Margaret E. The Job You Want. Dallas: Gregg Division, McGraw-Hill Book Company, 1968.

B. Blackledge, Walter L., Ethel H. Blackledge and Helen J. Keily. The Job You Want--How To Get It. 2nd ed. Cincinnati: South-Western Publishing Company, 1975.

C. Kushner, John A. and Helen J. Keily. How to Find and Apply for a Job. 3rd ed. Cincinnati: South-Western Publishing Company, 1975.

# UNIT V

## JOB APPLICATION AND INTERVIEW

### INFORMATION SHEET 1--PREPARING FOR THE APPLICATION

I. Application Terms

   A. Applicant--The person applying for a job.

   B. Interviewer--The person who interviews the applicant.

   C. Personal data information sheet--A written list of important information about the applicant.

      (NOTE: Also called résumé or vita sheet.)

   D. Reference--Person, usually not a relative, who can give information about the applicant.

   E. Marital status--Is the applicant single, married or divorced?

   F. Extracurricular activities--What the applicant does for fun when not working.

   G. Fringe benefits--The "extras" provided by an employer, such as paid vacations, sick leave, and insurance protection.

   H. Qualifications--The training, schooling, and experience needed by an applicant for a job.

   I. Vocational preparation--Skills in a vocational area gained while going to school or working.

II. Writing a résumé

   (NOTE: This is a written list of a person's experience and training which is given to the interviewer or manager of a company.)

   A. Standards

      1. Written in correct order.

      2. Neatly written or typed.

      3. Free from spelling errors.

      4. Presented in an outline form.

      5. Limited to one page.

      6. Tells the truth about ability and experience.

B. Information to be included

1. Name, address, phone number.
2. Type of job being sought.
3. Small picture of self.
4. Personal information
    a. Age, weight, height.
    b. Health.
    c. Date of birth.
    d. Marital status.
    e. Social Security Number.
5. Educational information
    a. Name and address of schools attended.
    b. Dates you attended each school.
    c. Subjects studied.
    d. Awards and out of class activities.
6. Work experience
    a. Name and address of company or companies where you have worked.
    b. How long you worked there.
    c. Briefly tell what you did in that job or jobs.
7. Tell about any special skills.
8. References--Be sure to get permission from person(s) before using name as a reference.

III. Applying for a job

A. Writing a letter of application

1. Use letter style you wish.
2. Arrange neatly.
3. Give information in a clear order.
4. Be sure what you say can be easily understood.

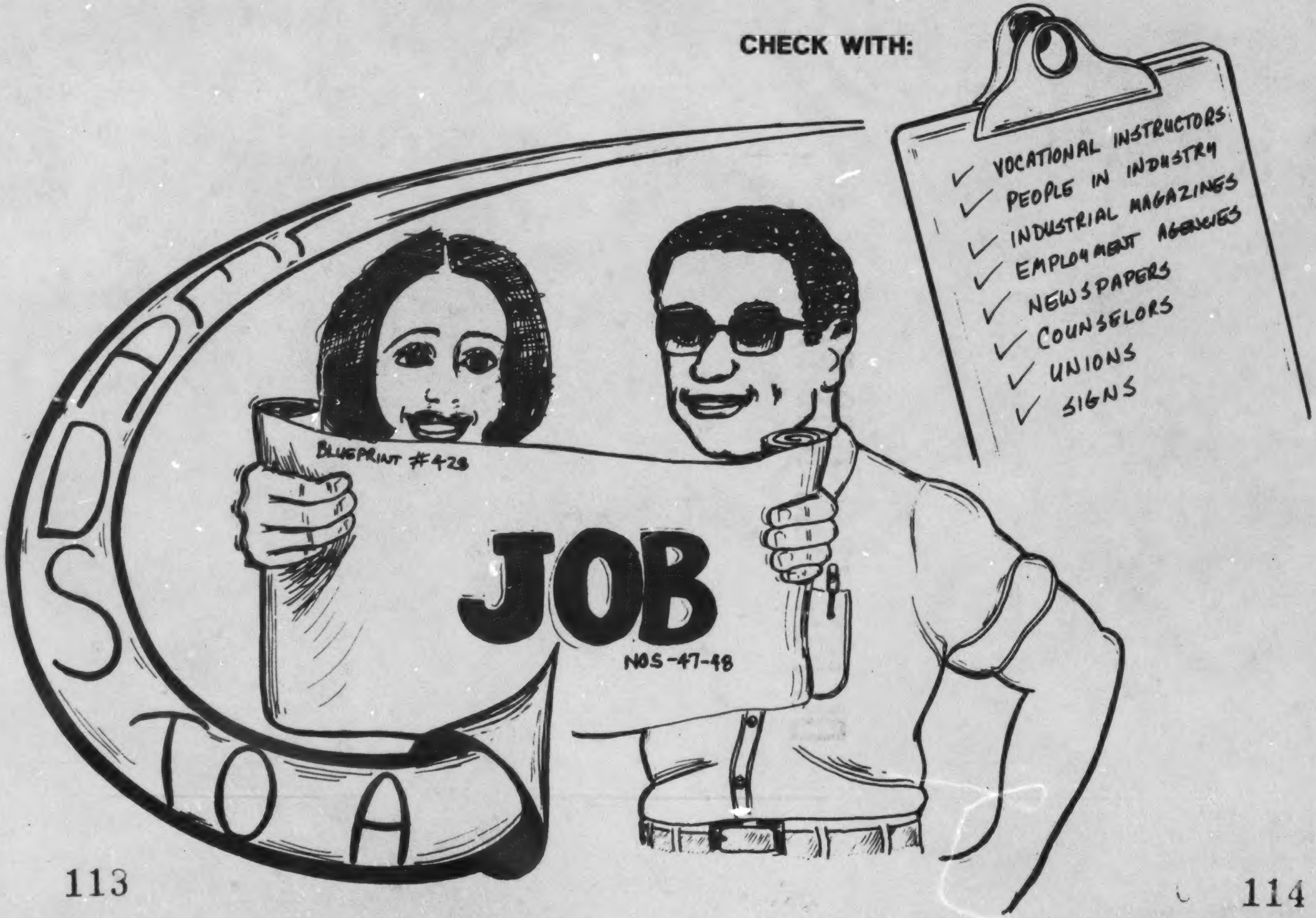
5. Be brief and to the point.
6. Write in a positive tone.
7. Have letter free from erasures and paper clean.
8. Be sure you haven't made any errors.
9. Include the following information:
    a. How you found out about the job opening.
    b. Job wanted.
    c. Reason for interest in job.
    d. Reason why you think you can do the job.
    e. Where your résumé can be found.
    f. Skills you can perform.
    g. Ask for more information about job.
    h. Include your address and telephone number

B. Applying by telephone

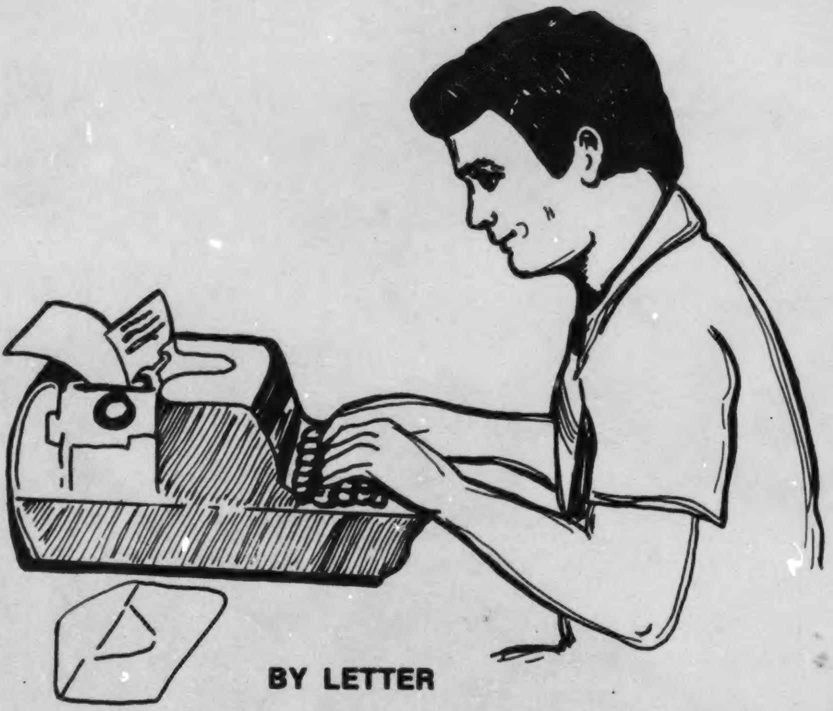
1. Give your name.
2. Ask if the job has been filled.
3. Find out exactly what the job requires.
4. Ask for an application form.
5. Ask for an appointment for an interview.
6. Mention your résumé, if you have one.
7. Give your address and telephone number.

# HOW TO FIND A JOB

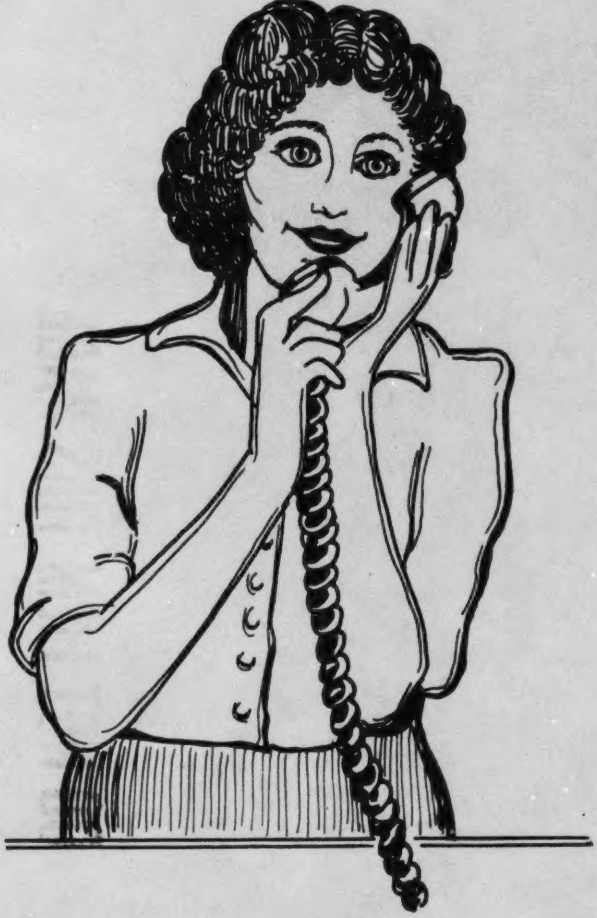
**CHECK WITH:**


✓ VOCATIONAL INSTRUCTORS
✓ PEOPLE IN INDUSTRY
✓ INDUSTRIAL MAGAZINES
✓ EMPLOYMENT AGENCIES
✓ NEWSPAPERS
✓ COUNSELORS
✓ UNIONS
✓ SIGNS
BLUEPRINT #428
JOB
NOS-47-48
TO A

# HOW TO GET A JOB APPLICATION FORM:



BY LETTER



BY TELEPHONE

# UNIT V

# JOB APPLICATION AND INTERVIEW

## INFORMATION SHEET 2--THE INTERVIEW

I. Proper dress and grooming for an interview

(NOTE: Find out how the employees dress for the job because you should dress better than you would dress for the job when you interview.)

A. Body clean and odor-free.

B. Freshly shaven.

C. Hair neat, clean, and trimmed.

D. Hands and nails clean and trimmed.

E. Makeup freshly-applied.

F. Teeth brushed.

G. Mouthwash used.

H. Clothing clean and pressed.

I. Conservative clothing style.

J. Hosiery free of runs.

K. Socks match clothes.

L. Shoes clean and polished.

II. Steps in preparing for an interview

A. Call or write for an appointment.

B. Know about the job for which you are applying.

C. Learn about the company.

D. If possible, find out the name of the interviewer.

E. Review personal qualifications.

F. Think through possible questions interviewer might ask, such as:

1. Why you want to work for this particular company.

2. Why you left a previous job.

        3. What courses you enjoyed in school.
        4. How you spend your spare time.
        5. Your out-of-school activities.
        6. Your vocational goals.
        7. Your grades in school.
        8. The salary you expect.

    G. Prepare questions to ask about the company
        1. Is the job permanent?
        2. What type of advancement is there in the company?
        3. What are the fringe benefits?
        4. What kind of salary increases are included?
        5. When can you find out whether or not you were hired?

    H. Prepare a card with the following types of information that may be needed on the application form.
        1. Dates required on forms.
        2. Correct spelling of difficult words.
        3. Names, addresses, and phone numbers of persons used as references.

III. Proper conduct during an interview

    A. Greet interviewer with a friendly smile.
    B. Call interviewer by name.
    C. Introduce self.
    D. Shake hands firmly with interviewer.
    E. Sit in a chair only after the interviewer asks you.
    F. Avoid slouching in the chair.
    G. Allow the interviewer to lead the conversation.
    H. Be polite during the interview.
    I. Avoid interrupting the interviewer.

J. Keep résumé and examples of work ready.

K. Give your answers clearly.

    1. Think about what to say before answering.

    2. Use correct grammar.

    3. Avoid slang.

    4. Keep eye contact with the interviewer.

L. Be sincere and enthusiastic.

M. Avoid annoying things like:

    1. Smoking or chewing gum.

    2. Squirming in chair.

    3. Crossing legs.

    4. Tapping fingers.

N. Answer questions honestly about self.

O. Watch for any signs the interviewer is through talking to you.

P. Thank the interviewer for the time allowed.

Q. Leave at once when the interview is over.

IV. Things employer looks for in you during an interview

A. Enthusiasm and interest.

B. A sense of company loyalty.

C. Sincerity.

D. Alertness and quickness of mind.

E. Honesty.

F. Desire to work.

G. Desire to improve oneself.

V. Reasons for not getting a job after an interview

A. Poor grooming habits.

B. Poorly displayed personality.

    1. Chip on shoulder.

2. Improper attitude toward work.
3. Overly emotional.
4. Spoke in a negative manner about former jobs and people you worked for.

C. Late for interview.

D. Application form filled out improperly.

1. Did not follow directions.
2. Did not answer all questions.
3. Did not write legibly.
4. Gave incorrect information.

E. Poor school grades, records, and too many absences and tardies.

## UNIT V

## JOB APPLICATION AND INTERVIEW

### ASSIGNMENT SHEET 1--WRITING A LETTER OF APPLICATION FOR EMPLOYMENT

Directions: Write a letter of application to a possible employer, using your own choice of letter style. Use the sample letter on the next page as a guide when writing the letter.

## SAMPLE LETTER OF APPLICATION

444 West Washington
Anywhere, Texas 77777
January 15, 1977

Mr. James Zimmerman
Personnel Manager
La-Nad Corporation
222 Finale Street
Anywhere, Texas 77777

Dear Mr. Zimmerman:

Please consider me for the building maintenance position which your company advertised in the Gazette.

The skills I've learned in my Building Maintenance classes qualify me for the position. I have worked with many different construction hand and power tools. I understand the safety involved working around construction power tools. Our Building Maintenance class has worked in the shop in an organized and safe manner. This has given me a broad understanding of construction repair processes. A more complete description of my qualifications is provided on my enclosed résumé.

May I come for an interview at your convenience? I can be reached by telephone at 555-4444 or by mail at 444 West Washington, Anywhere, Texas 77777.

Sincerely,

John Johnson

Enclosure

## UNIT V

## JOB APPLICATION AND INTERVIEW

### ASSIGNMENT SHEET 2--MAKING AN APPOINTMENT BY PHONE

Directions: Using a simulated telephone situation, role play an applicant interested in a particular job opening with the instructor role-playing the employer's receptionist. After completing the telephone conversation, complete the checklist below. If you answer "no" to any question, your conversation was not up to par and could hinder you from getting the job.

| CHECKLIST | YES | NO |
|---|---|---|
| 1. Were prepared before calling | | |
| 2. Did not stutter and stammer to find the right words | | |
| 3. Identified yourself immediately | | |
| 4. Relayed your purpose for calling immediately | | |
| 5. Inquired as to the best time for the interviewer to see you | | |
| 6. Were courteous and friendly | | |
| 7. Thanked the receptionist | | |
| 8. Recorded the interview date, hour, and location | | |

# UNIT V

# JOB APPLICATION AND INTERVIEW

## ASSIGNMENT SHEET 3--PREPARING AND WRITING A RÉSUMÉ

Directions: Write a résumé to include with your letter of application. Select the style of your choice or use the example on the next page as a guide.

# SAMPLE VITA
# RÉSUMÉ
# PERSONAL DATA SHEET

NAME : John Johnson

ADDRESS : 444 W. Washington
Anywhere, Texas 77777

TELEPHONE: 555-4444

EDUCATION: Senior at Blank High School to be graduated in May

| | | | |
|---|---|---|---|
| AGE | : 17 years | HEALTH | : Excellent |
| WEIGHT | : 117 | MARITAL STATUS: | Single |
| HEIGHT | : 5'6" | DATE OF BIRTH : | 3-15-60 |

SUBJECTS STUDIED:

Science

English

General Metal Trades

Mathematics

STUDENT ACTIVITIES:

Vice-President, Vocational Opportunities Club of Texas

Member Senior Homecoming Committee

SPECIAL SKILLS:

Can operate metal lathe, milling machine, shaper, grinders, drill press, and other power tools.
Have used all metal working hand tools for layout, jig and fixture work, assembly, and measurement.
Have completed various precision projects from blueprints.
Have performed arc and oxyacetylene welding operations

WORK EXPERIENCE:

Worked on several projects in school for various individuals and worked part-time for Riggs Machine Shop maintaining and setting up equipment.

REFERENCES:

Mr. Ted Boswell
CVAE Instructor
Blank High School
124 W. 4th
Anywhere, Texas 77777

Ms. June Riggs
Owner, Riggs Machine Shop
456 W. 8th
Anywhere, Texas 77777

## UNIT V

## JOB APPLICATION AND INTERVIEW

### ASSIGNMENT SHEET 4--QUESTIONS THE EMPLOYER MAY ASK

Directions: In a job interview, it is your responsibility to "sell" yourself. You must be prepared to answer any questions asked in a manner that will leave a favorable impression. Select any 10 questions contained on the next sheet and write the question number and your answers to those questions in the space provided.

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

# QUESTIONS FREQUENTLY ASKED DURING THE EMPLOYMENT INTERVIEW

1. What are your future plans?
2. In what school activities have you participated? Which did you enjoy most?
3. How do you spend your spare time? What are your hobbies?
4. In what type of position are you most interested?
5. Why do you think you might like to work for our company?
6. What jobs have you held? How were you obtained and why did you leave?
7. What courses did you like best? Least? Why?
8. Why did you choose your particular field of work?
9. How did you spend your vacations while in school?
10. What do you know about our company?
11. Do you feel that you have received a good general training?
12. What can you do that makes you feel that you will be successful in your field?
13. In what out of school activities have you participated?
14. What are your ideas on salary?
15. How do you feel about your family?
16. How interested are you in sports?
17. Do you prefer to live in a certain town?
18. What are your other work related interests?
19. How much money do you hope to earn at age 30? 35?
20. Why did you decide to go to this particular school?
21. Do you think that your extracurricular activities were worth the time you devoted to them?
22. What do you think helps a person get promotions in a good company?
23. What personal characteristics are necessary for success in your chosen field?

24. Why do you think you would like this particular type of job?

25. What are your parents' occupations?

26. Tell me about your home life during the time you were growing up.

27. Do you like to work with others or by yourself?

28. What kind of boss do you prefer?

29. Are you just interested in making money, or do you really like to help other people, too?

30. Can you take instructions without feeling upset?

31. Do you live with your parents? What person has had the greatest influence on you?

32. How did previous employers treat you?

33. What have you learned from some of the jobs you have had?

34. Can you get recommendations from previous employers?

35. What interests you about our product or service?

36. Do you feel you have done the best work you could in your classes?

37. What do you know about opportunities in the field which you were trained?

38. Have you ever had any trouble in getting along with fellow students and teachers?

39. How do you get your spending money?

40. Have you saved any money?

41. Do you like routine work?

42. Do you like regular hours?

43. What size city do you prefer?

44. What is your major weakness?

# UNIT V

## JOB APPLICATION AND INTERVIEW

### ASSIGNMENT SHEET 5--COMPLETING AN EMPLOYMENT APPLICATION FORM

Directions: Complete the application form on the following pages and use the following rules:

A. Scan the entire application form before you begin.

B. Follow the instructions on the form exactly.

C. Write legibly.

D. Use ink when writing on an application form unless you are told to use pencil.

E. Write all facts needed, but be brief.

F. Fill in all the blanks.

  1. Write "N/A" or "not applicable" for questions that don't apply to you.

  2. If there is no answer, write "none".

G. Know complete addresses, titles, and phone numbers of references and former employers.

H. When finished, read what you have written to be sure it is correct.

V-33

# APPLICATION FOR EMPLOYMENT

## PERSONAL INFORMATION

Date Social Security Number

Name Age Sex

Last First Middle

Present Address

Street City State

Permanent Address

Street City State

Phone No. Own Home Rent Board

Date of birth Height Weight Color of Hair Color of Eyes

Married Single Widowed Divorced Separated

Number of children Dependents other than wife or children Citizen of U.S.A. Yes ☐ No ☐

If related to anyone in our employ, state name and department Referred by

## EMPLOYMENT DESIRED

Position Date you can start Salary desired

Are you employed now? If so may we inquire of your present employer

Ever applied to this company before? Where When

| EDUCATION | Name and Location of School | Years Attended | Date Graduated | Subjects Studied |
|---|---|---|---|---|
| Grammar School | | | | |
| High School | | | | |
| College | | | | |
| Trade, Business or Correspondence School | | | | |

Subjects of special study or research work

What foreign languages do you speak fluently? Read Write

U.S. Military or Naval service Rank Present membership in National Guard or Reserves

Activities other than religious (civic, athletic, fraternal, etc.)

Exclude organizations the name or character of which indicates the race, creed, color or national origin of its members

Last

First

Middle

(CONTINUED ON OTHER SIDE)

130

V-34

**FORMER EMPLOYERS** List below last four employers, starting with last one first

| Date Month and Year | Name and Address of Employer | Salary | Position | Reason for Leaving |
|---|---|---|---|---|
| From<br>To | | | | |
| From<br>To | | | | |
| From<br>To | | | | |
| From<br>To | | | | |

**REFERENCES:** Give below the names of three persons not related to you, whom you have known at least one year.

| | Name | Address | Business | Years Acquainted |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |

**PHYSICAL RECORD:**

List any physical defects

Were you ever injured? Give details

Have you any defects in hearing? In vision? In speech?

In case of emergency notify

Name Address Phone No.

I authorize investigation of all statements contained in this application. I understand that misrepresentation or omission of facts called for is cause for dismissal. Further, I understand and agree that my employment is for no definite period and may, regardless of the date of payment of my wages and salary, be terminated at any time without any previous notice.

Date Signature

DO NOT WRITE BELOW THIS LINE

Interviewed By Date

**REMARKS:**

Neatness Character

Personality Ability

Hired For Dept. Position Will Report Salary Wages

Approved: 1 2. 3.

Employment Manager Dept. Head General Manager

131

# UNIT V

# JOB APPLICATION AND INTERVIEW

## ASSIGNMENT SHEET 6--THE DO's and DON'Ts of the INTERVIEW

Directions: Point out the correct things to do during an interview by writing Do or Don't in each of the blocks on the left.

_______ 1. Stress your qualifications for the job opening.

_______ 2. Give experiences you have had which would fit you for the job.

_______ 3. Keep stressing your need for the job.

_______ 4. Apologize for your age.

_______ 5. Talk and think, as much as possible, about the future rather than the past.

_______ 6. Be overconfident.

_______ 7. Beg to be considered.

_______ 8. Show, where possible, your ability to keep a job, your good attendance records, and safety experience.

_______ 9. Discuss past experience which has no relation to the job for which you are applying.

_______10. Remember that older persons, too, are capable, dependable, trainable, careful, and steady on a job.

_______11. Try to learn before the interview about the company and its products.

_______12. Speak with a muffled voice.

_______13. Try to make the interviewer think you can do everything.

_______14. Give the "right" answer, even if it is untrue.

_______15. Speak with confidence.

_______16. Approach the employer with respect and dignity.

_______17. Have a positive attitude.

_______18. Maintain poise and self-control.

_______19. Give your ideas on pay and working hours early in the interview.

______20. Arrive late and out of breath for the interview.

______21. Keep poise and self-control.

______22. Hesitate to fill out an application or give references.

______23. Try to overcome nervousness.

______24. Go to the interview without a record of your former jobs.

______25. Stress the contribution you can make to the business.

______26. Apply for a certain job.

______27. Know what you can, and cannot, do.

______28. Answer questions honestly and openly.

______29. Hold yourself erect.

______30. Be well-groomed and correctly dressed.

______31. Do not mention the contacts who told you about the job.

______32. Show you are willing to learn.

______33. Know the importance of getting along with people.

______34. Feel that the world owes you a living.

______35. Make claims that you can't deliver.

______36. Ask the interviewer of any possible job openings in the future if there are not any at the time.

______37. Be a "know it all".

______38. Have ready a list of any former employers.

______39. Act as if you feel that you are less important than others.

______40. Hang around to keep the interview going as long as possible.

## UNIT V

## JOB APPLICATION AND INTERVIEW

### ASSIGNMENT SHEET 7--EVALUATING THE JOB INTERVIEW

Directions: In a role-playing situation, you will participate in a job interview with your instructor acting out the part of the interviewer. Prepare yourself as you would for an actual job interview. After completing the job interview, evaluate the interview situation according to the following checklist by placing a "✓" in the appropriate column.

| APPEARANCE | YES | NO |
|---|---|---|
| 1. Clothing clean and well pressed? | | |
| 2. Clothing conservative in style? | | |
| 3. Body clean and odor free? | | |
| 4. Hair trimmed, clean, and combed? | | |
| 5. Shoes polished? | | |

| BEHAVIOR | YES | NO |
|---|---|---|
| 1. Greeted interviewer with a smile? | | |
| 2. Called the interviewer by name? | | |
| 3. Introduced self? | | |
| 4. Shook interviewer's hand? | | |
| 5. Sat only when asked to do so? | | |
| 6. Kept eye contact with interviewer? | | |
| 7. Listened carefully to what interviewer said? | | |
| 8. Thought questions out before answering? | | |
| 9. Spoke well of previous employers and associates? | | |
| 10. Showed desire to work? | | |
| 11. Were open to new ideas? | | |
| 12. Were enthusiastic about school, work, and life in general? | | |

| | YES | NO |
|---|---|---|
| 13. Asked questions about the job and the company? | | |
| 14. Were prepared to tell how you could benefit the company? | | |
| 15. Were honest in telling your qualifications and experiences? | | |
| 16. Did not chew gum, smoke, or eat candy? | | |
| 17. Answered questions briefly and to the point? | | |
| 18. Were on time for the interview? | | |
| 19. Thanked the interviewer for his/her time? | | |
| 20. Left promptly? | | |

If you answered "NO" to any of the above questions, your chances for getting the job are reduced.

# UNIT V

## JOB APPLICATION AND INTERVIEW

### ASSIGNMENT SHEET 8--WRITING A FOLLOW-UP LETTER

Directions: Write a follow-up letter to thank an employer for an interview. Select a format of your own or follow the format on the next page. Be sure that the letter is neatly written or typed without errors. Express your appreciation for the time spent for the interview. Provide a brief statement of your qualifications and your interest for the job. Give your name, address, and telephone number.

321 S. Main
Jordin, Texas 75428
February 1, 1980

Mr. Bob Jones
Personnel Manager
3-H Enterprises
120 Industrial Blvd.
New City, Texas  77000

Dear Mr. Jones:

Thank you for the time you took for the interview with me in regard to the Building Maintenance position with your company. I feel that working for 3-H Enterprises would be most interesting and that I could easily perform the tasks that the job requires. I hope to have the opportunity to prove my skills in this job.

I would be available to begin work June 1st. You may call me at home after 5 p.m. at 456-6543.

Sincerely

Bennye Johnson

# UNIT V

# JOB APPLICATION AND INTERVIEW

## ANSWERS TO ASSIGNMENT SHEETS

Assignments 1 through 5

Evaluated to the satisfaction of the instructor.

Assignment 6

1. Do
2. Do
3. Don't
4. Don't
5. Do
6. Don't
7. Don't
8. Do
9. Don't
10. Do
11. Do
12. Don't
13. Don't
14. Don't
15. Do
16. Do
17. Do
18. Do
19. Don't
20. Don't
21. Do
22. Don't
23. Do
24. Don't
25. Do
26. Do
27. Do
28. Do
29. Do
30. Do
31. Don't
32. Do
33. Do
34. Don't
35. Don't
36. Do
37. Do
38. Do
39. Don't
40. Don't

Assignments 7 and 8

Evaluated to the satisfaction of the instructor.

## UNIT V

## JOB APPLICATION AND INTERVIEW

### TEST--PART 1

1. Match the following terms with their correct definitions.

_____ a. applicant

_____ b. personal data information sheet

_____ c. reference

_____ d. marital status

_____ e. extracurricular activities

_____ f. fringe benefits

_____ g. qualifications

_____ h. vocational preparation

_____ i. interviewer

1. The "extras" provided by an employer
2. Tells whether the applicant is single, married, or divorced
3. Person, usually not a relative, who can give information about the applicant
4. Person who interviews the applicant
5. The person applying for a job
6. The training, schooling, and experience needed by an applicant for a job
7. Skills in a vocational area gained while going to school or working
8. Written list of information about applicant
9. Tells what an applicant does for fun

2. Point out the items of information to be included on a résumé by placing a "✓" in the correct blanks below.

_____ a. Name, address, and phone number

_____ b. Salary

_____ c. Type of employment being sought

_____ d. Work experience

_____ e. Grades made in school

_____ f. Subjects studied in school

_____ g. Parents' occupations

_____ h. References

3. List the two methods of applying for a job.

a.

b.

## UNIT V

## JOB APPLICATION AND INTERVIEW

### TEST--PART 2

1. Circle the letter in front of each of the following which are examples of proper dress and grooming for an interview.

   a. Blue jeans and T-shirts

   b. White socks with a black suit

   c. Teeth brushed

   d. Mouthwash used

   e. Shoes cleaned and polished

   f. Hands and nails cleaned and trimmed

   g. Socks or hosiery with holes showing

   h. Wrinkled shirt

   i. Body clean and odor free

   j. Deodorant that was applied the day before

2. Select the correct ways to prepare for an interview by answering true or false to each of the following statements.

   _____ a. An appointment for an interview is not necessary.

   _____ b. Know about the job for which you are applying.

   _____ c. Learn about the company before you interview.

   _____ d. You do not need to know the name of the interviewer.

   _____ e. Review your personal qualifications.

   _____ f. Wait until asked to answer the interviewer's questions.

   _____ g. Do not make the interview too long by asking questions.

   _____ h. Interview in your work clothes so they will think you are a hard worker.

   _____ i. Do not prepare notes on things to remember because they will think you have a short memory.

   _____ j. Plan to arrive late so the interviewer will think you stay busy.

3. Place a "✓" beside those statements which are proper conduct during an interview.

_____ a. Never smile during an interview.

_____ b. Always call the interviewer by first name.

_____ c. Introduce self.

_____ d. Shake hands with the interviewer softly.

_____ e. Sit in a chair only after the interviewer asks you to.

_____ f. Sit straight, but comfortable.

_____ g. Try to keep the lead during the conversation.

_____ h. Remain polite during the interview.

_____ i. Interrupt the interviewer anytime a question enters your mind.

_____ j. Keep a résumé and examples of your work handy.

_____ k. Express ideas and views clearly.

_____ l. Show sincerity.

_____ m. Smoke during the interview, if desired.

_____ n. Answer questions honestly.

_____ o. Look for signs to indicate the interview is over.

_____ p. Thank the interviewer for the time allowed and leave promptly.

4. Select the positive attitudes an employer looks for during an interview by placing a "✓" in front of each.

_____ a. Enthusiasm and interest

_____ b. A sense of dedication

_____ c. Know-it-all

_____ d. Sincerity

_____ e. alertness

_____ f. Dishonesty

_____ g. Desire to get the easiest job

_____ h. Desire to improve one self

5. List five reasons one may not get a job after an interview.

a.

b.

c.

d.

e.

# UNIT V

# JOB APPLICATION AND INTERVIEW

## ANSWERS TO TEST

### PART 1

1. a. 5
   b. 8
   c. 3
   d. 2
   e. 9
   f. 1
   g. 6
   h. 7
   i. 4

2. a. ✓
   b.
   c. ✓
   d. ✓
   e.
   f. ✓
   g.
   h. ✓

3. a. Write a letter of application.
   b. Apply by telephone.

### PART 2

1. c.
   d.
   e.
   f.
   i.

2. a. false
   b. true
   c. true
   d. false
   e. true
   f. false
   g. false
   h. false
   i. false
   j. false

3. a.
   b.
   c. ✓
   d.
   e. ✓
   f. ✓
   g.
   h. ✓
   i.
   j. ✓
   k. ✓
   l. ✓
   m.
   n. ✓
   o. ✓
   p. ✓

4. a. ✓
   b. ✓
   c.
   d. ✓
   e. ✓
   f.
   g.
   h. ✓

5. Answer should include:
   a. Poor grooming habits
   b. Poor personality
   c. Late for interview
   d. Application filled out improperly
   e. Poor school grades, records, and excessive absences and tardies

# UNIT VI

## GENERAL SAFETY

### UNIT OBJECTIVE

After completing this unit, the student will be able to define safety, state the individual, group, and general safety rules, and apply these to situations in the metal trades shop. This knowledge will be evidenced through demonstration and by scoring 100% on a unit test.

### SPECIFIC OBJECTIVES

After completing this unit, the student will be able to:

1. Explain safety as it applies to an individual.
2. Point out the importance of good safety attitudes.
3. Point out the ways you can practice personal safety.
4. Explain how to take part in group safety.
5. Select the correct safety rules to be followed in the shop.
6. Select the proper clothing and personal protective equipment for shop work.
7. Select the correct safety rules to follow when using hand tools.
8. Select the correct safety rules to follow when using power tools.
9. Select the correct safety rules associated with fire safety.
10. Point out the classes of fires according to the material burning.
11. Point out the types of fire extinguishers and methods of use.
12. Select the correct procedures for evacuating the building in case of a fire.
13. Identify types of burns and the correct treatment of each.
14. Complete a safety pledge form.
15. Develop a safety poster for a specific area in the shop.

16. Select the proper safety attitudes for General Metal Trades.
17. Point out the proper safety factors for each situation in the shop.
18. Explain the meaning of various safety rules.
19. Apply safety rules to shop situations.
20. Draw a building evacuation plan.
21. List things that can be done to prevent fires in the class, community, and home.

## UNIT VI

## GENERAL SAFETY

### SUGGESTED TEACHING ACTIVITIES

I. Objective sheet

  A. Discuss unit objectives with students.

  B. Discuss each specific objective with the students.

  C. Have the students complete the objectives in the most logical sequence for the shop organization.

  D. Add any necessary objectives.

II. Information and assignment sheets

  A. INFORMATION SHEET 1--WHAT SAFETY CAN BE

    1. Explain the relationship of the shop's safety program to OSHA and industrial safety.

    2. Stress the importance of each individual's safety attitude and participation in the shop safety program.

    3. Use the following assignment sheets to reinforce this area of information:

      a. ASSIGNMENT SHEET 1--SAFETY PLEDGE FORM

        (1) Have the students fill out the forms and have their parents or guardians sign in the space provided.

        (2) File the forms for later reference.

      b. ASSIGNMENT SHEET 2--SAFETY POSTER

        (1) Provide poster board and drawing materials for the students to use in constructing posters.

        (2) Display the posters on the shop walls.

      c. ASSIGNMENT SHEET 3--SELECTING SAFETY ATTITUDES

        (1) Discuss ways safety attitudes can be developed.

        (2) Discuss each of the answers as it relates to the shop.

B. INFORMATION SHEET 2--SHOP SAFETY

1. Discuss how each safety rule applies to the shop work.
2. Discuss the type of clothing available and required in the shop.
3. Use ASSIGNMENT SHEET 4--MATCHING SAFETY TERMS AND SITUATIONS to reinforce this area of information.

C. INFORMATION SHEET 3--TOOL AND EQUIPMENT SAFETY

1. Give examples of misused tools and equipment in the shop.
2. Show examples of tools which are unsafe to use.
3. Post safety posters about the use of hand and power tools.
4. Use the following assignment sheets to reinforce this area of information.
    a. ASSIGNMENT SHEET 5--EXPLAINING SAFETY RULES
        (1) The students may need to review INFORMATION SHEET 4 to complete questions regarding fire safety before completing this activity.
        (2) Explain each answer as it applies to the shop.
    b. ASSIGNMENT SHEET 6--SAFETY RULE APPLICATION
        (1) This assignment calls for a more complex explaination of safety rules and can be used with the more advanced students.
        (2) The questions may be given orally to stimulate class discussion.

D. INFORMATION SHEET 4--FIRE SAFETY

1. Arrange for a guest speaker from the fire department to make a presentation on:
    a. "Types of Fires"
    b. "Types of Fire Extinguishers"
    c. "Treatment of Burns"
2. Explain the use of the fire equipment in the shop.
3. Show the location of first aid materials for burns.

4. Use the following assignment sheets to reinforce this area of information:

   a. ASSIGNMENT SHEET 7--BUILDING EVACUATION

      (1) Explain the methods of evacuating the shop in case of fires.

      (2) Post the best drawings at exits in the shops.

   b. ASSIGNMENT SHEET 8--PREVENTING FIRES

      (1) Give some examples of things the class might do as a group to promote fire prevention.

      (2) Put together a master list of the better ideas that are turned in to give the students.

III. Transparency masters

(NOTE: Transparency masters are included in the student manual and may be used as information sheets.)

A. TM-1--WHAT TO INCLUDE IN YOUR SAFETY PROGRAM

B. TM-2--DON'T JUST PREACH SAFETY--PRACTICE IT

C. TM-3--LEARN TO RECOGNIZE UNSAFE CONDITIONS

D. TM-4--AVOID HORSEPLAY

E. TM-5--BE SURE YOU HAVE PROPER VENTILATION

F. TM-6--REMEMBER TO REMOVE DANGEROUS JEWELRY OR CLOTHING

G. TM-7--USE HAND TOOLS CORRECTLY

H. TM-8--MAKE SURE THE POWER CAN'T COME ON WHEN MAKING ADJUSTMENTS

I. TM-9--TYPES OF FIRE EXTINGUISHERS

J. TM-10--KNOW YOUR FIRE EXTINGUISHERS

IV. Answers to assignments

(NOTE: Answers may vary, but class participation is more important than specific answers.)

V. Test

A. The test is divided into four parts

(NOTE: Each part covers one information sheet.)

B. Various approaches may be used in testing.

  1. Each part of the test may be given as the student reviews the information on one information sheet.

  2. Give the entire test upon completion of all the information sheets in the unit.

  3. Give one or more parts of the test as an additional assignment, or to reinforce areas the student did not understand.

C. Have each student take the test until 100% accuracy is achieved.

(NOTE: The test may be given orally to students who lack writing abilities.)

D. File the graded tests in the students' permanent files.

E. Add test parts corresponding to any information area or sheets added to the unit.

VI. Answers to the test

A. Answers are based on the total information covered in the unit.

B. For convenience of grading, make corresponding answer sheets for additional test parts.

VII. References

A. Henrich, H. W. Industrial Accident Prevention. 4th ed. Manchester, Missouri: McGraw-Hill Book Co., Webster Division, 1959.

B. Kigire, Denis J. Teacher Liability in School Shop Accidents. Ann Arbor, Michigan: Prokken Publications, Inc., 1963.

C. Occupational Curriculum Laboratory. Instructor's Guide: An Introduction to Shop and Laboratory Teaching. 7th ed. Commerce, Texas: East Texas State University, 1977.

D. Division of Occupational Safety. Occupational Safety and Health Standards. Austin: Texas State Department of Health.

E. Poster Director. National Safety Council, Chicago 1966-67.

F. School Shop Safety Manual. Board of Education of the City of New York, Brooklyn, 1965.

G. Williams, William A. Accident Prevention Manual For Shop Teachers. Chicago: American Technical Society, 1969.

# UNIT VI

# GENERAL SAFETY

## INFORMATION SHEET 1--WHAT SAFETY CAN BE

I. Explanation of Safety

   A. Being careful so you are not injured or cause an accident.

   B. OSHA

      1. Occupational Safety and Health Act--Began in 1970

      2. The law assures every working man or woman in the nation safe and healthful working conditions and the safekeeping of our human resources.

      3. The law also organized accident-prevention programs in the school shops.

   C. General safety includes:

      1. Attitudes

      2. Personal safety

      3. Group safety

      4. Shop safety

      5. Clothing and personal protective equipment

      6. Hand tool safety

      7. Power tool safety

      8. Fire safety

II. Safety attitude

   A. The proper safety attitude is a must in GENERAL METAL TRADES shop, where each student will be working with hazardous equipment.

   B. Most accidents are caused by thoughtless people.

   C. Every student must be on guard against accidents at all times.

   D. Visiting in the shop should be avoided because it distracts from a person's alertness around hazardous equipment.

III. Personal safety

A. Involves protecting yourself from injury caused by your own or other's carelessness

B. Involves being aware of unsafe conditions and practices

C. Involves protecting others by practicing your own personal safety

IV. Group safety

A. Should include the entire class

B. Realize that every student's actions can be a reaction on you

C. Stress classroom safety to your classmates when you are working together

# UNIT VI

# GENERAL SAFETY

## INFORMATION SHEET 2--SHOP SAFETY

I. Shop safety rules

A. Do not horseplay in the shop.

B. Keep the shop clean.

C. Observe all posted safety rules.

D. Do not operate equipment without permission.

E. Report all injuries even if they seem small.

F. Know the location of all fire extinguishers and exits.

G. Remove rings, watches, and other jewelry before working in shop areas.

H. Keep oily rags in a closed metal container.

I. Wipe up spilled oil, grease, or other slippery substances from the floor.

J. Keep paint, thinners, and other flammable materials in a metal cabinet.

K. Do not run in the shop. Running is very dangerous.

L. Keep all machines and tools clean and in good working order.

M. Do not use compressed air to clean machines of metal chips and cutting oil.

N. Get help when moving heavy objects.

O. Have adequate ventilation for jobs where fumes and dust are a hazard.

P. Never operate a machine until all guards are in place.

Q. Be alert at all times. Do not take chances.

R. Report all breakage or damage to equipment immediately to the instructor.

II. Clothing and personal protective equipment

A. Dress properly. Do not wear loose clothes.

B. Wear a cap when working around moving parts to keep hair from getting caught in machinery.

C. Wear proper eye protection at all times.

D. Roll up long sleeves to above your elbows.

E. Wear an apron or shop coat to protect your clothes from oil and dirt.

F. Canvas-type shoes are not recommended when working in the metal shop.

G. Wear heavy socks and protective shoes in the metal shop.

H. Wear special protective clothing when working in the foundry, forge, and welding areas.

I. Wear gloves, where applicable, to avoid burns and cuts.

J. Do not wear gloves around machinery and rotating parts.

## UNIT VI

## GENERAL SAFETY

### INFORMATION SHEET 3--TOOL AND EQUIPMENT SAFETY

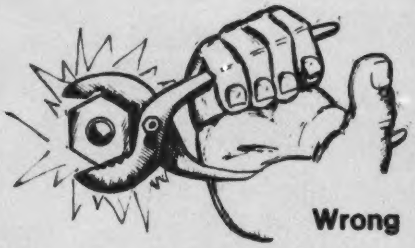
I. Hand tool safety

A. Always focus your full attention on the work.

B. Use the right tool for the job you are doing.

C. Learn how to use the tool properly.

D. Keep tools in their best condition.



E. Keep each tool in its place.

F. When using sharp-edged tools, cut away from your body.

G. Keep sharp-edged tools away from the edge of a bench or work area.

H. Carry sharp-pointed tools with the cutting edge or point down.

I. Keep tools sharp and clean.

J. Always use a handle on a file.

K. Do not strike hardened metal or tools with a hard-faced hammer.

L. Avoid mushroomed or battered heads on metal tools by keeping them ground smooth and square.

M. Never carry sharp and pointed tools in your pockets.

N. Do not use worn or broken tools.

II. Power tool safety

A. Be sure all power tools are grounded with three-wire conductor cord.

B. Power tools should be inspected and serviced regularly by qualified maintenance personnel.

C. Read and understand all of the manufacturer's safety recommendations.

D. Be familiar with the operation procedures of the tool

E. Inspect electrical cords to see that they are in good condition

F. Do not leave electrical cords where they may be run over or damaged

G. Be sure that all safety guards are in place and in working order

H. Remove a tie, rings, or a wristwatch, and roll up long sleeves before using power tools

I. Be sure that your hands are dry

J. Make all adjustments and inspections with the power "Off" and the cable "Disconnected."

K. Before connecting to a power source, be sure that the switch is in the "Off" position

L. Wear safety goggles and a dust mask when the work requires it

M. Be sure that the materials being worked are securely clamped in the machines and will clear all machine parts when moving

N. Keep your attention focused on the work

O. A change in sounds during power-tool operation can indicate trouble and should be checked immediately

P. When work is completed, shut off all power tools

Q. When work is completed, disconnect the power tool from the power source

R. After the tool is disconnected, remove blades, bits, or any other cutter from the tool

S. Store power tools and blades, bits, or other cutters in their proper place

T. When the power tool will not work properly, remove it from service.

# UNIT VI

## GENERAL SAFETY

## INFORMATION SHEET 4--FIRE SAFETY

I. General rules

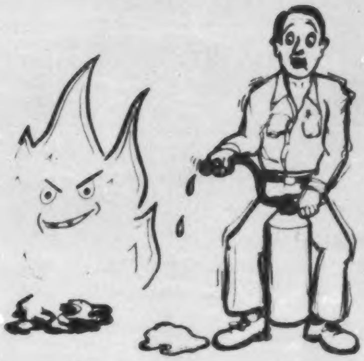
A. Practice fire prevention

B. Find out what material is burning when a fire starts

C. Report a fire quickly

D. Know how to use a fire extinguisher

(WARNING: DO NOT play with firefighting equipment because it may not work when you need it.)



Wrong

E. Know the types of extinguishers

(WARNING: Using the wrong type of extinguisher on a fire is dangerous.)

F. Know the location of the fire alarm

G. Know how to treat burns

H. Keep a clean shop, with flammables stored properly

I. Know the correct way to leave a building in case of fire

(NOTE: If there is not a plan on how to leave the building in case of fire posted by the door, ask your instructor for instructions.)

II. Types of fires

A. Class A--Ordinary combustibles such as wood, paper, or cloth

B. Class B--Flammable liquids or grease such as gasoline, paints, or oils

C. Class C--Electrical equipment such as motors and switches

III. Types of extinguishers

   A. Foam

      1. Used on Class A and B fires

      2. To use, turn extinguisher upside down

      3. Spray so that foam falls on fire

   B. Carbon dioxide

      1. Used on Class B and C fires

      2. To use, squeeze handle

      3. Spray near the fire base and move upward

   C. Soda acid

      1. Used on Class A fires

      2. To use, turn extinguisher upside down

      3. Spray at the base of the fire

   D. Water

      1. Used on Class A fires

      2. To use, squeeze handle

         (Note: A water hose or bucket may also be used.)

      3. Spray at the base of the fire

   E. Dry chemical

      1. Use on Class A, B, and C fires

      2. To use, squeeze handle

      3. Spray at the base of the fire

IV. Building evacuation

   A. Close all windows and doors as you leave the building

      (NOTE: Have someone in your class assigned to do this.)

B. Leave the building quickly but in an orderly manner.

(NOTE: Do not run or shove.)

C. Know the best route to take when leaving the building, but also know alternate routes.

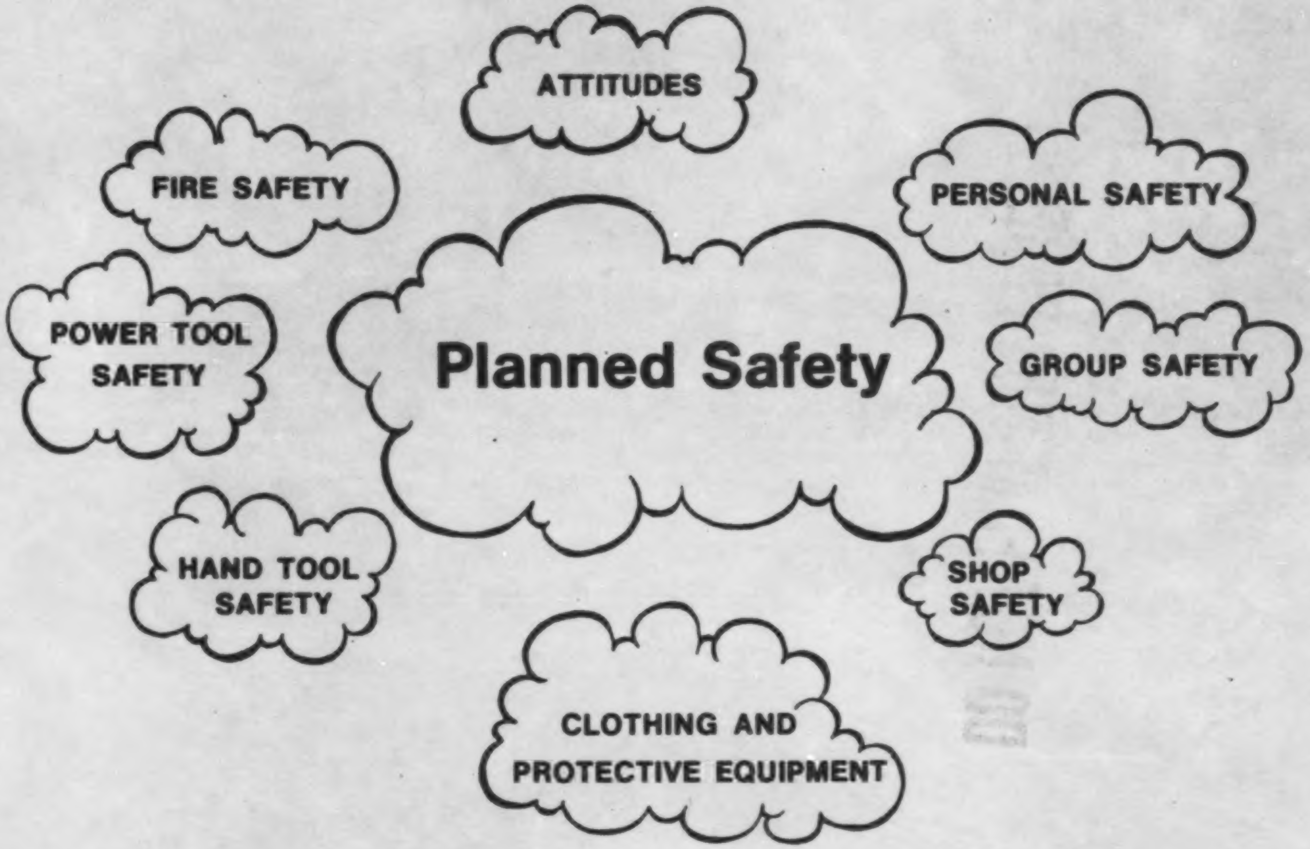
(NOTE: Help others get out of the building.)

D. Move away from the building during a fire.

(NOTE: Explosions often occur during a fire.)

| V. | Types of burns | Appearance of skin | Treatment |
|---|---|---|---|
| A. | First degree | Reddened skin | Apply cold water |
| B. | Second degree | Blistered skin | Apply cold water and sterile gauze |
| C. | Third degree | Charred or seared skin | Get immediate medical help |

# WHAT TO INCLUDE IN YOUR SAFETY PROGRAM



**Planned Safety**

ATTITUDES

FIRE SAFETY

PERSONAL SAFETY

POWER TOOL SAFETY

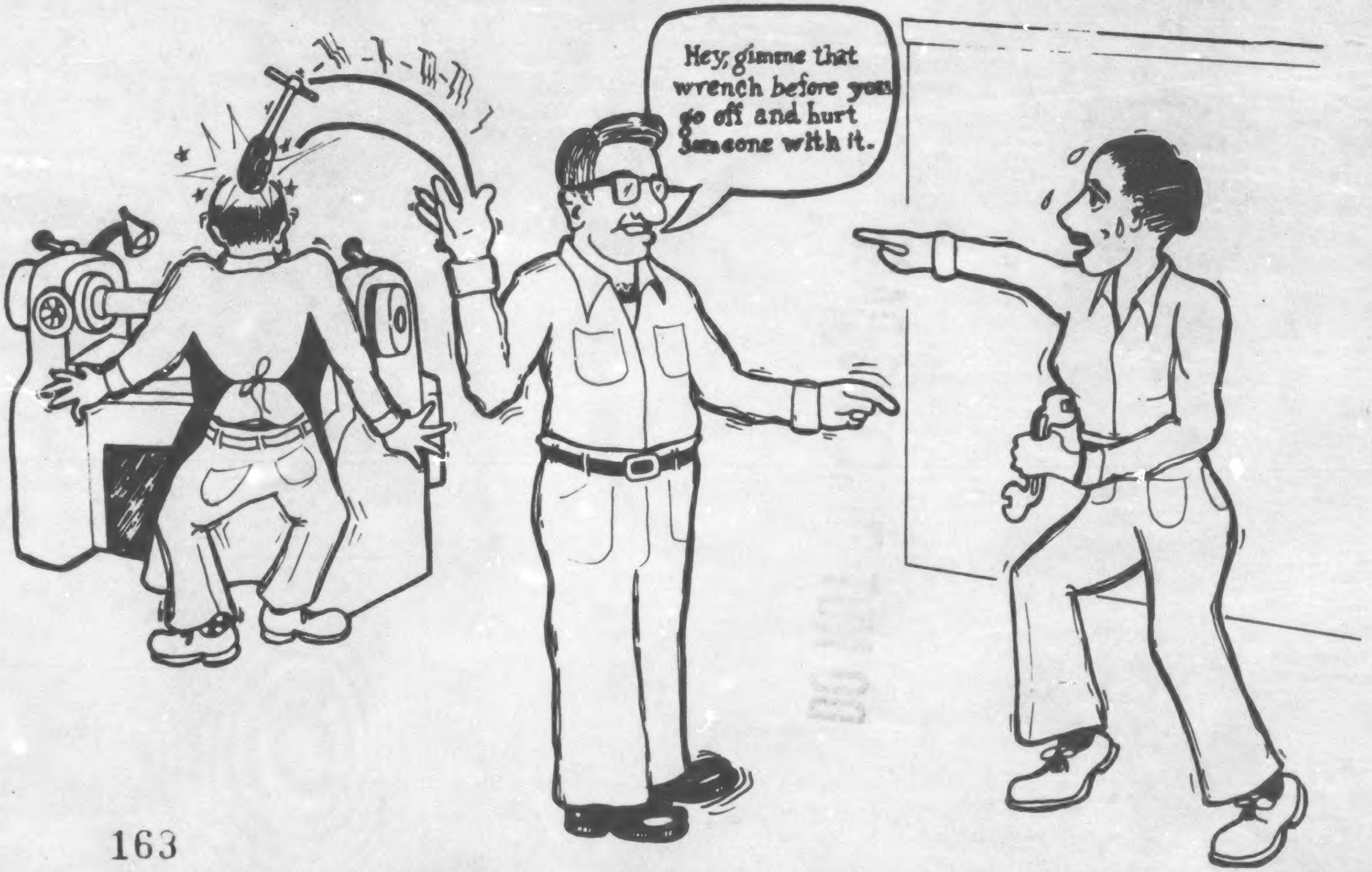
GROUP SAFETY

HAND TOOL SAFETY

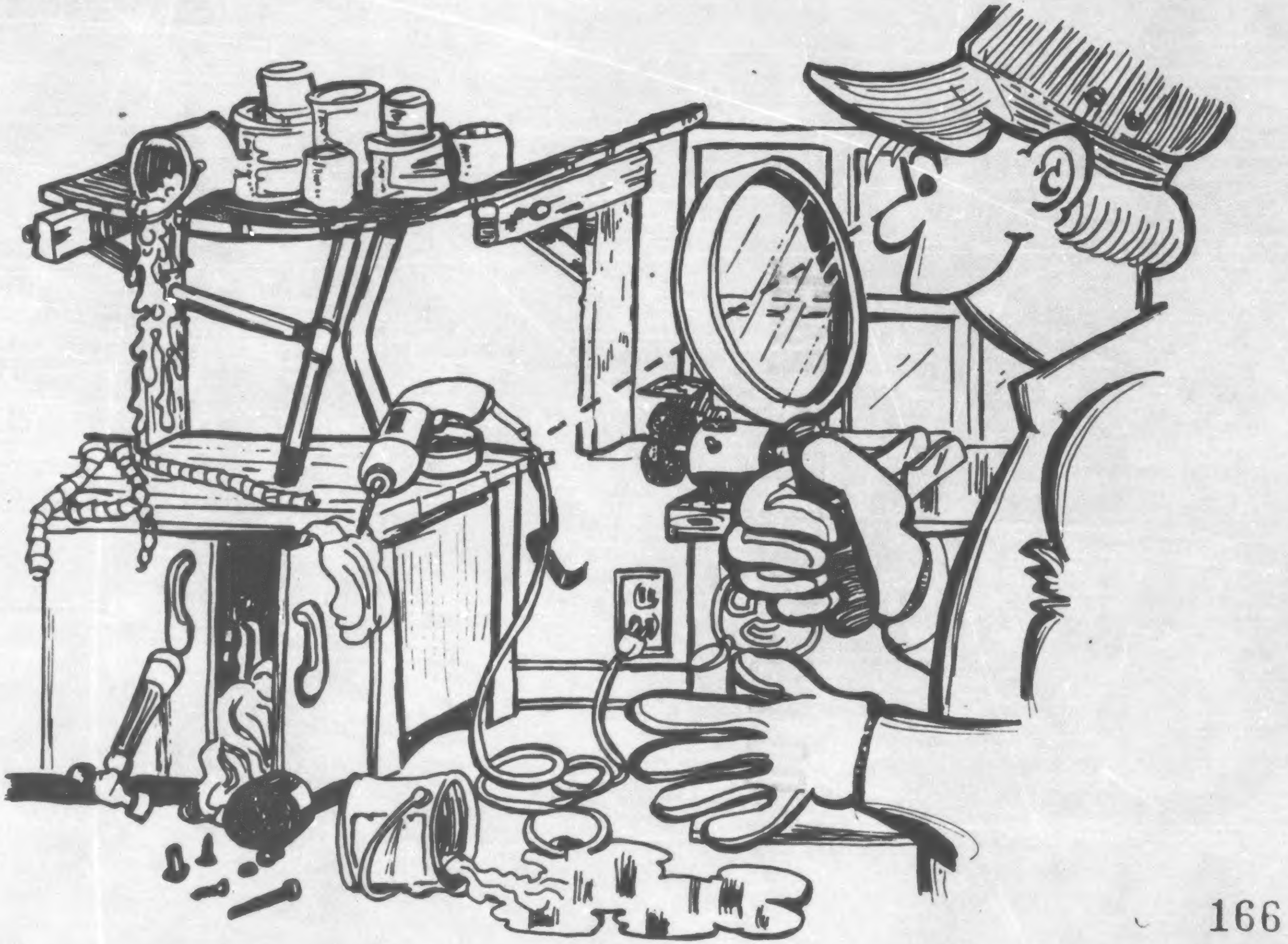
SHOP SAFETY

CLOTHING AND PROTECTIVE EQUIPMENT

# DON'T JUST PREACH SAFETY---PRACTICE IT


Hey, gimme that wrench before you go off and hurt someone with it.

# LEARN TO RECOGNIZE UNSAFE CONDITIONS

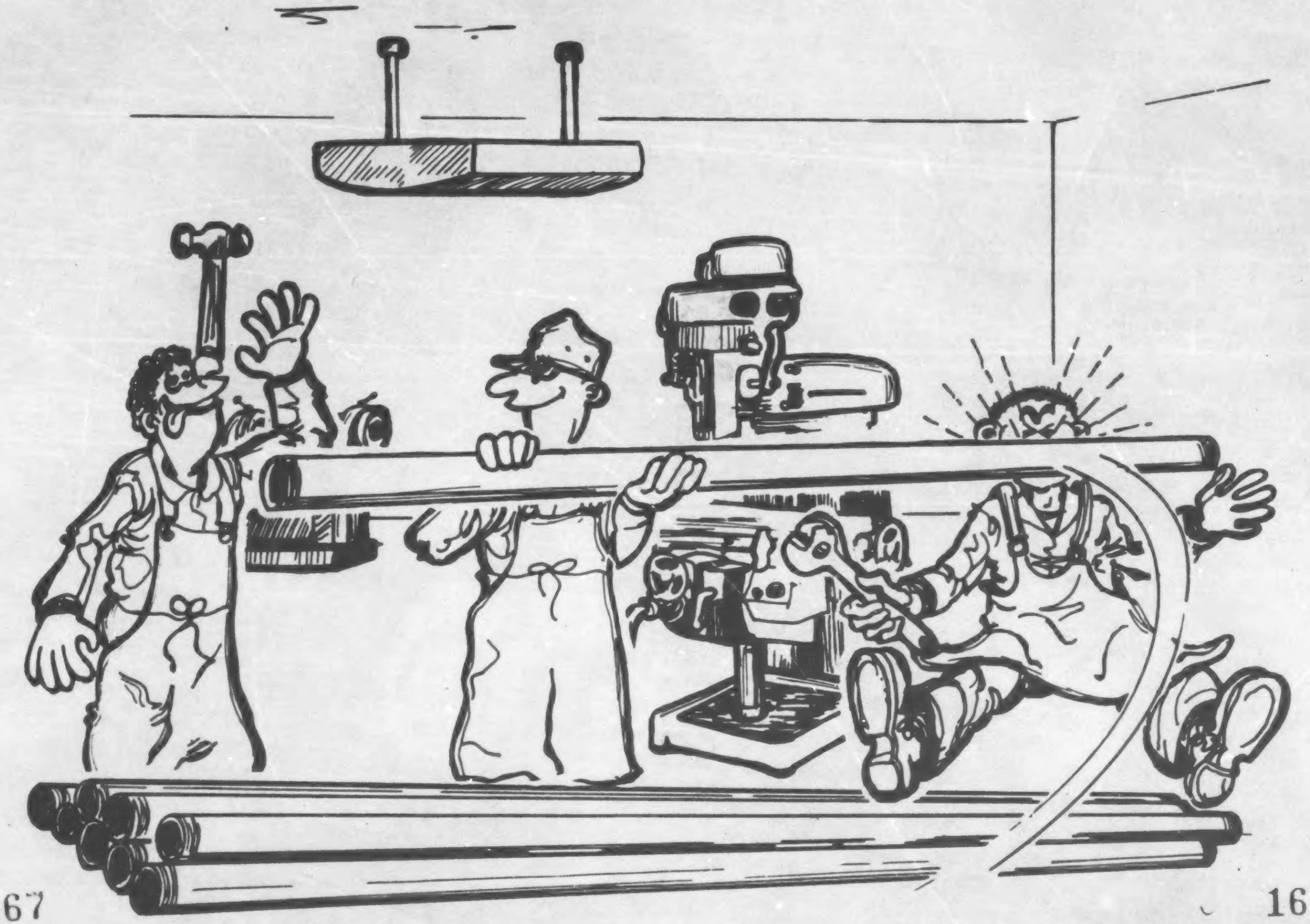


TM-3

165

166

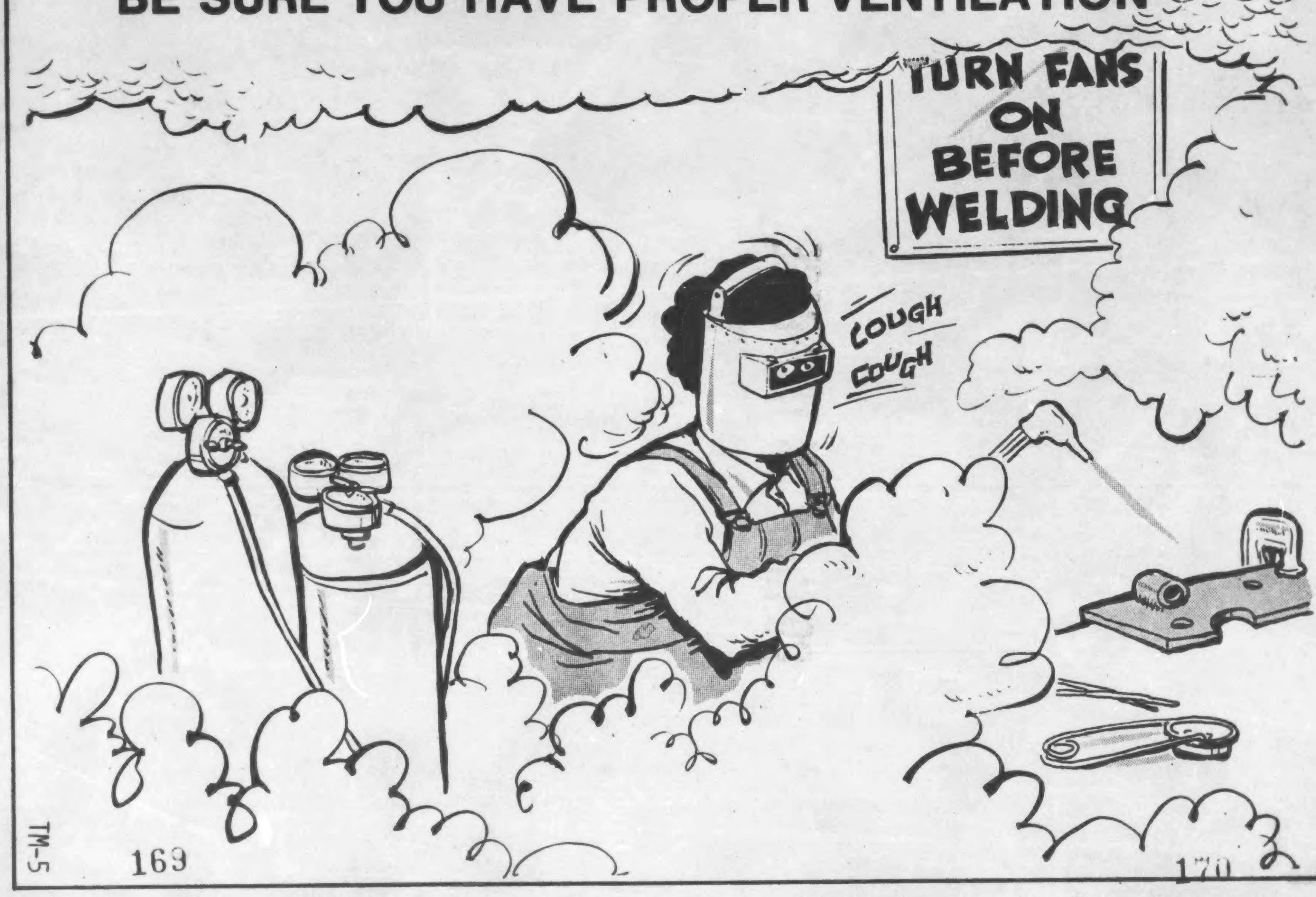
# AVOID HORSEPLAY



TM-4 167

168 VI-23

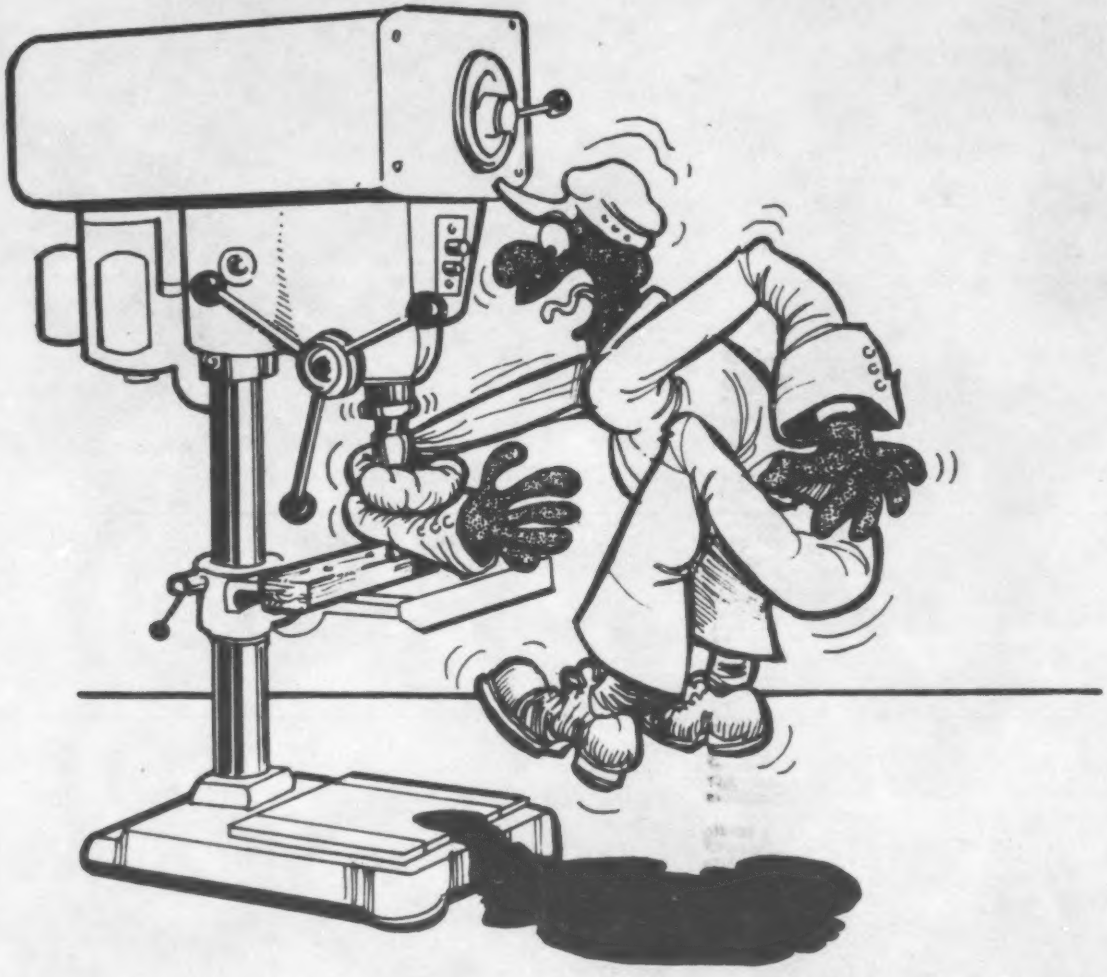
# BE SURE YOU HAVE PROPER VENTILATION


TURN FANS ON BEFORE WELDING
COUGH
COUGH

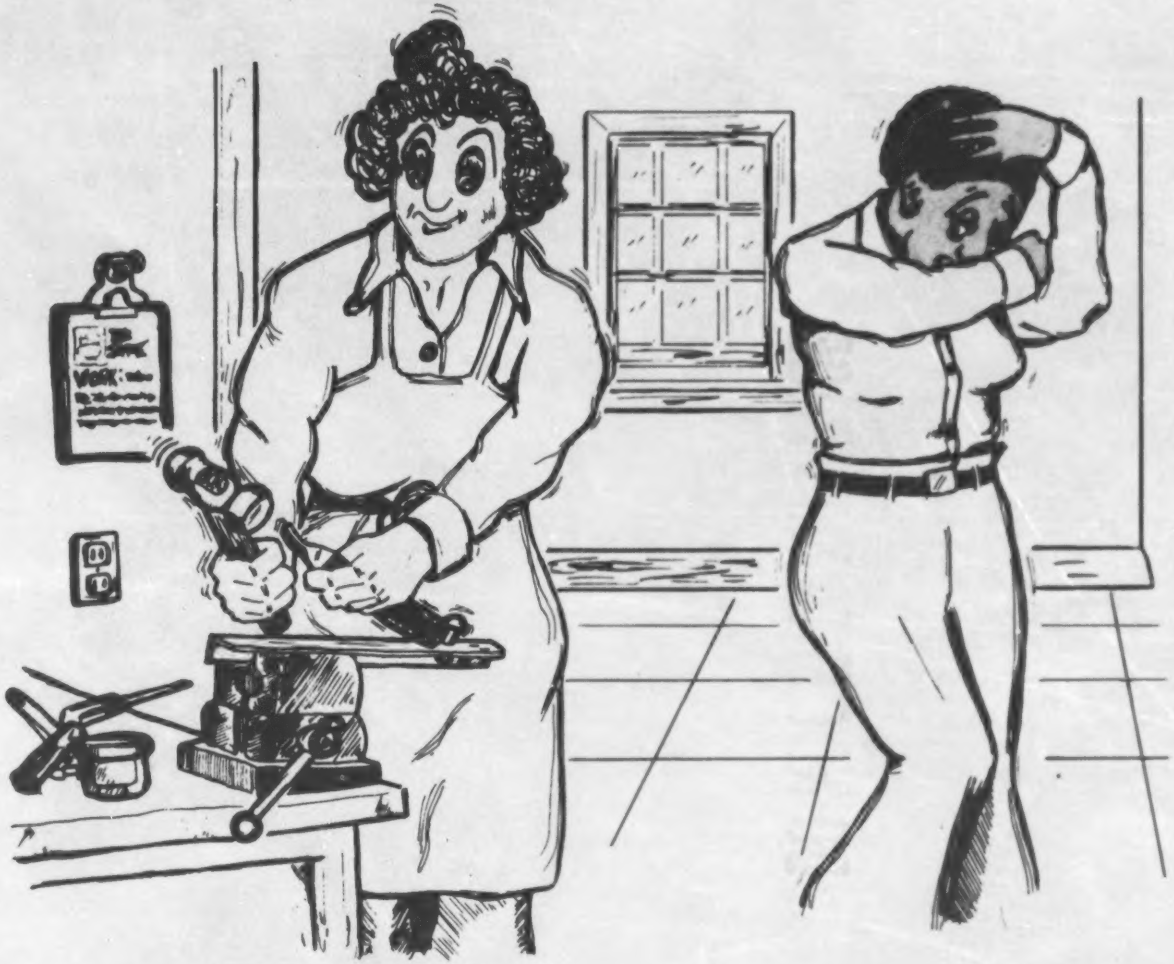
TM-5

VI-25

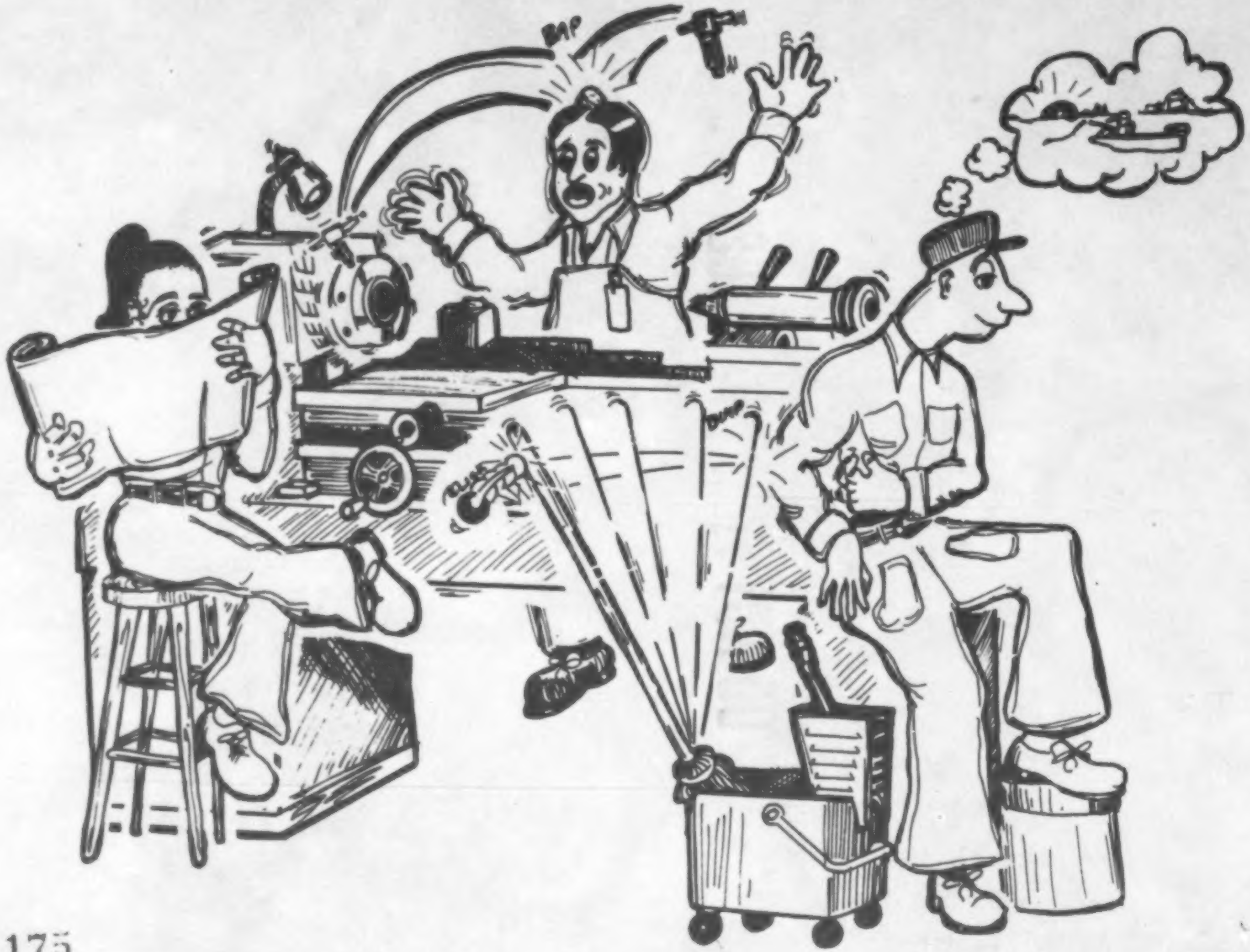
# REMEMBER TO REMOVE DANGEROUS JEWELRY OR CLOTHING



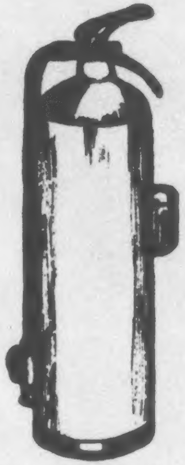
# USE HAND TOOLS CORRECTLY

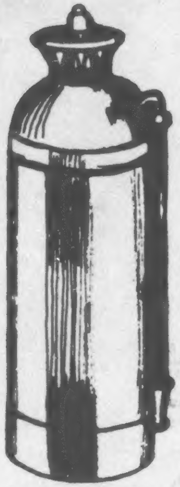


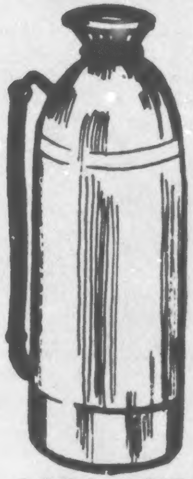
# MAKE SURE THE POWER CAN'T COME ON WHEN MAKING ADJUSTMENTS

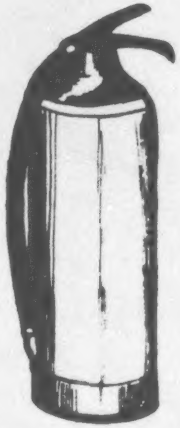


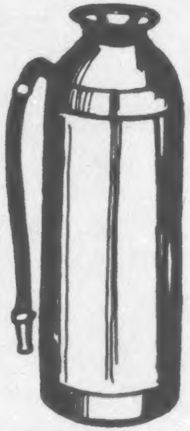
# TYPES OF FIRE EXTINGUISHERS

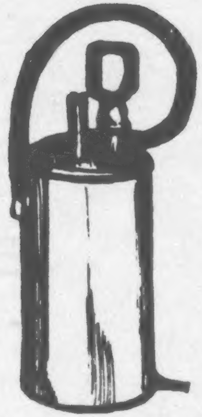

DRY CHEMICAL

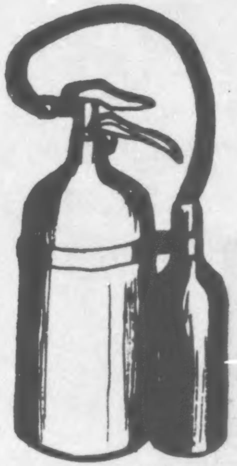

GAS CARTRIDGE


SODA ACID


PRESSURIZED WATER

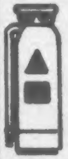
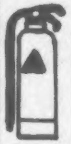
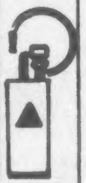
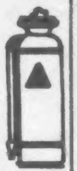
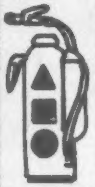
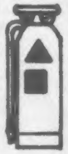
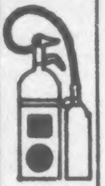
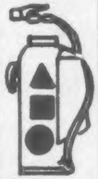
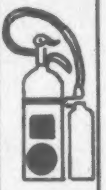
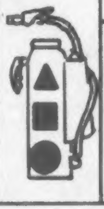

FOAM


PUMP TANK

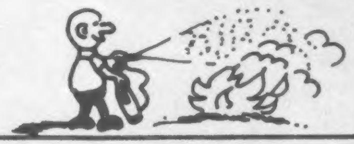
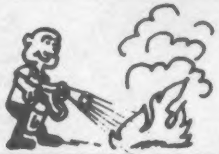
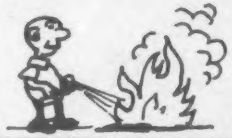
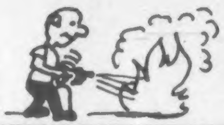
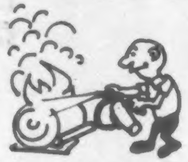

CARBON DIOXIDE

TM-9

# KNOW YOUR FIRE EXTINGUISHER

|  | TYPE OF EXTINGUISHER |  |  |  |  |  |
|---|---|---|---|---|---|---|
| DECIDE THE CLASS OF FIRE YOU ARE FIGHTING | FOAM | CARBON DIOXIDE | WATER | PUMP TANK | GAS CARTRIDGE | DRY CHEMICAL |
| A<br>WOOD<br>PAPER<br>CLOTH<br>ETC. |  |  |  |  |  |  |
| B<br>GASOLINE<br>PAINTS<br>OILS |  |  |  |  |  |  |
| C<br>MOTORS<br>SWITCHES |  |  |  |  |  |  |

## HOW TO OPERATE

|  |  |
|---|---|
|  | FOAM: Don't spray the stream into the Burning Liquid. Allow Foam to Fall Lightly on Fire . |
|  | CARBON DIOXIDE: Direct Discharge as Close to Fire as Possible. First at Edge of Flames and Gradually Forward and Up |
|  | SODA-ACID, GAS CARTRIDGE: Direct Stream at Base of Flames |
|  | PUMP TANK: Place Foot on Footrest and direct Stream at Base of Flames |
|  | DRY CHEMICAL: Direct at Base of Flames.<br>In the Case of Class A Fires, Follow up Up by Directing the Dry Chemicals at Remaining Flames |

## UNIT VI

## GENERAL SAFETY

### ASSIGNMENT SHEET 1--SAFETY PLEDGE FORM

DIRECTIONS: Before the student will be allowed to use any type of hand tools or power equipment in the metal shop, this safety pledge form must be signed by the student and parents or legal guardians. The student will return signed form to the teacher, who will keep it on file in the department.

________________________, who is enrolled in ______________________,

will as part of the course of instruction operate machines or equipment as safely as possible providing that parents or legal guardians give written permission.

It is understood that each student will be given proper instruction, both on the use of equipment and correct safety procedures, before being allowed to operate such equipment. The student will assume responsibility for the following safe practices and is therefore asked to subscribe to the following safety pledge:

1. I promise to follow all safety rules.
2. I promise never to use a machine without first having the instructor's permission.
3. I will pass a safety test with 100% accuracy before asking permission to operate equipment.
4. I will report all accidents and injuries to the instructor immediately.
5. I promise not to horseplay while in the metal shop.

Date:__________________ Student's Signature_________________________

Parents' Consent

I hereby give my written consent to allow my child to operate all machines and equipment necessary to meet the requirements of the course.

Date:____________________ Parent's Signature _____________________

(NOTE: Parents are cordially invited to visit the shop to inspect the machines and equipment, and discuss the safety aspects of them.)

# UNIT VI

# GENERAL SAFETY

## ASSIGNMENT SHEET 2--SAFETY POSTER

DIRECTIONS: Develop a safety poster, using a 12" x 18" sheet of construction paper and pencil. Use one of the specific safety rules for one of the following shop areas:

(Note: Be creative and neat. Posters will be displayed in the shop.)

Oxyacetylene Welding
Electric Arc Welding
Machine Shop
Sheetmetal
Foundry
General Shop
Hand Tools
Power Tools

# UNIT VI

# GENERAL SAFETY

## ASSIGNMENT SHEET 3--SELECTING SAFETY ATTITUDES

DIRECTIONS: Select proper attitudes by answering TRUE or FALSE in the space provided at the left of each statement.

_______ 1. The reason someone usually gets hurt in a shop is due to carelessness.

_______ 2. Safety in the shop applies only when you are operating machinery.

_______ 3. Learning the skill is more important than learning safety on the job.

_______ 4. Injuries should be reported at once.

_______ 5. Accidents don't happen; they are caused by people.

_______ 6. It is all right to break small minor safety rules if one is careful.

_______ 7. When lifting heavy objects, it is always best to lift with your back.

_______ 8. Goals for safety should be clean work areas, use of safeguards, and following safety rules.

_______ 9. Hand tools are safe and can't cause injuries.

_______10. Horseplay is allowed in the shop if you are careful.

_______11. Running in the shop is permitted only if you are in a hurry.

_______12. Ask questions if in doubt about how to do a job in a safe manner.

_______13. Protect your eyes at all times.

_______14. Wear the clothing that is correct for the job.

_______15. You can operate machines when you feel like it.

_______16. Safety includes proper clean-up and equipment maintainence.

_______17. It is not your responsibility to clean up oil spills that were made by others.

_______18. You should tell others if you see them doing something incorrectly or without the proper safety equipment.

_______19. Safety glasses should be worn only when you know there are possible eye hazards.

_______20. Safety rules posted on machines are for anyone that uses that machine.

## UNIT VI

## GENERAL SAFETY

### ASSIGNMENT SHEET 4--MATCHING SAFETY TERMS AND SITUATIONS

DIRECTIONS: Match the statement on the left with the correct word or words in the right hand column. Place the correct letter in the space provided to the left.

_____ 1. When working with sharp tools always

_____ 2. Hand tools should be

_____ 3. All files should have

_____ 4. Protect your eyes when

_____ 5. To prevent accidents, always

_____ 6. A person who violates safety rules should be

_____ 7. Oily rags are to be placed in a

_____ 8. Spilled oil and grease can cause you to

_____ 9. Long hair should be contained by a

_____10. Power tools should be properly

_____11. Training for safety creates

_____12. Lifting with your back can cause

_____13. Eye injuries can be caused by

_____14. Electrical shock can result from

_____15. Working safely is a

_____16. Know how to fight fires with

_____17. Charred flesh burns are

_____18. OSHA is

_____19. Accidents are caused by

_____20. Horseplay in the shop is

A. Wood handles

B. Cap

C. Not allowed

D. Grounded

E. Slip and fall

F. Third degree

G. Frayed cords

H. Carelessness

I. Good habit

J. Flying chips

K. Extinguishers

L. Grinding

M. A law protecting workers

N. Safety awareness

O. Metal container

P. Reported to instructor

Q. A bad injury

R. Cut away from you

S. Stay alert

T. Kept clean and repaired

## UNIT VI

## GENERAL SAFETY

### ASSIGNMENT SHEET 5--EXPLAINING SAFETY RULES

DIRECTIONS: Answer each of the following questions in the space provided.

1. Describe the meaning of OSHA.

2. Why are most accidents caused?

3. How can accidents be prevented?

4. What should you do if you should have the slightest injury?

5. Seared or charred skin is considered a ____________________ degree burn;

   If skin is blistered, it is a ________________ degree burn;

   If skin is reddened only it is a _____________ degree burn.

6. What degree burn should receive immediate medical treatment?

7. What is the best type of shirt to wear in the shop?

8. Why is jewelry dangerous in a machine shop?

9. What should be worn over long hair?

10. When should gloves be worn?

11. What should be worn to protect the eyes?

12. When is oil or grease a hazard?

13. Why should you never attempt to stop a machine by hand?

14. When can you operate a machine?

15. What should you use to clean a machine?

16. Where are oily rags kept? Why?

17. Where and how should inflammable materials be stored?

18. List 3 safety rules for the use of hand tools.

    1.

    2.

    3.

19. Where are the fire extinguishers located in your shop?

20. List the 3 classes of fires and describe the type of fire extinguisher needed to put out a particular fire.

## UNIT VI

## GENERAL SAFETY

### ASSIGNMENT SHEET 6--SAFETY RULE APPLICATION

DIRECTIONS: After completing the previous assignment sheets and taking part in class discussions, answer the following study questions to prepare you for the safety test.

1. What is necessary to do a safe, but well-done job?

2. What is the proper dress when working around machinery?

3. Name 5 dangerous areas where eye protection is required.

4. What does ABC (Always Be Careful) of safety mean to you?

5. What is the best safety guideline to remember when using hand tools?

6. Why must you keep alert when operating machinery?

7. Describe the dangers when shop areas and floors are not clean.

8. Why should we follow safety rules?

9. How can you do your part in the shop's total safety program?

10. Why can group safety be the best way of controlling accidents?

# UNIT VI

# GENERAL SAFETY

## ASSIGNMENT SHEET 7--BUILDING EVACUATION

DIRECTIONS: Draw a sketch of your classroom and building. Include such details as hallways, doorways, fire escapes, windows, stairways, and other important features. Use a dark pen to draw the building, and a red pen to draw dotted lines and arrows showing the best paths to take when leaving the building during a fire. Write any notes on the drawing that you feel might tell a person what to do or expect during a fire.

# UNIT VI

## GENERAL SAFETY

### ASSIGNMENT SHEET 8--PREVENTING FIRES

DIRECTIONS: List the things you can do to prevent fires in each of the following instances. Be specific.

1. In your General Metal Trades class

2. In your community

3. In your home

# UNIT VI

# GENERAL SAFETY

## ANSWERS TO ASSIGNMENT SHEETS

### Assignment Sheet 1

The "Safety Pledge Form" must be taken home by the student, signed and dated by both the student and parent, and returned to the teacher by the student before the student will be allowed to work in the shop.

### Assignment Sheet 2

Evaluated to the satisfaction of the instructor.

### Assignment Sheet 3

1. True
2. False
3. False
4. True
5. True
6. False
7. False
8. True
9. False
10. False
11. False
12. True
13. True
14. True
15. False
16. True
17. False
18. True
19. False
20. True

### Assignment Sheet 4

1. R
2. T
3. A
4. L
5. S
6. P
7. O
8. E
9. B
10. D
11. N
12. Q
13. J
14. G
15. I
16. K
17. F
18. M
19. H
20. C

Assignment Sheet 5

(NOTE: Information should include the following general knowledge.)

1. Occupational Safety and Health Act of 1970--provides healthful working conditions
2. Carelessness of people
3. Being safety-conscious
4. Report the injury immediately and get treatment or first aid
5. Third degree, second degree, first degree
6. Third degree
7. Long sleeve shirt
8. Jewelry can be caught in moving machinery or can conduct electricity if it comes in contact with electrical connections
9. Some type of cap
10. When hands are in danger of getting burned and when handling metal with sharp or rough edges which could cut you. (Caution-Gloves are dangerous around moving parts of machines.)
11. Safety goggles or face shield
12. Because they can cause serious falls if they are on the floor. They can cause serious hand injuries when on hand tools; they are fire hazards and they can create an explosion if they come in contact with compressed oxygen
13. Because you may get caught by the machine's moving parts, causing serious injuries
14. Only after receiving the proper operating instructions and proper permission from the instructor
15. A brush to clean the metal chips, then a rag to wipe cutting oil.
16. In a closed metal container. Because they are fire hazards where spontaneous combustion occurs
17. In a safety container or a well-ventilated compartment, away from heat sources
18. Any three of the hand tool specific safety rules are accepted.
19. Locations of fire extinguishers vary from shop to shop. Ensure that student knows location situation of your particular shop.

20. Class A--Combustible materials
    Class B--Inflammable materials
    Class C--Electrical

    Class A--Foam, soda acid, water, $CO^2$ and dry chemical
    Class B--Foam, $CO^2$, dry chemical
    Class C--$CO^2$, dry chemical

Assignment Sheet 6

Answers should contain the following general information to be acceptable.

1. To know, understand, and practice the safety rules on the job to be performed.

2. Do not wear loose clothes. Roll sleeves up above the elbows. Wear a face shield or safety goggles. Remove rings, watches, and other jewelry which may get caught in revolving parts of machines. Hair should be trimmed or a cap worn to hold loose, long hair.

3. A. Grinding

   B. Machining

   C. Electric Welding

   D. Gas welding

   E. Forge

4. ABC of Safety means to Always Be Careful.

5. Use the right tool for the right job! don't mistreat tools; and be careful.

6. To keep from getting hands and fingers in rotating parts.

7. A. Scrap on floor can cause serious falls.

   B. Oil, grease, and other slippery substances will cause serious falls.

   C. Oil, grease, and other flammable liquids are fire hazards.

   D. Oily rags are fire hazards.

   E. Water is a good conductor of electricity and can cause shocks.

   F. Scrap on tables can fall and cause serious injuries.

8. A. To keep from getting hurt and to protect others.

   B. To develop good safe work habits.

9. By following all safety rules and taking part in the shop's safety program.

10. When every person in a shop is safety-conscious, it is less likely for an accident to occur because of carelessness.

Assignment Sheets 7 and 8

Evaluated to the satisfaction of the instructor.

## UNIT VI

## GENERAL SAFETY

### TEST--PART 1

1. Explain safety as it applies to you in the following areas:

   a. Define safety (Circle the correct answer.)

      (1) Freedom from machine trouble

      (2) Preventing accidents and injury

      (3) Looking around you

   b. The Occupational Safety and Health Act does which of the following? (Circle the correct answer.)

      (1) Provides medical help for the injured.

      (2) Assures every working person safe and healthful working conditions and preservation of human resources.

      (3) Organizes accident-prevention programs in school shops.

   c. General safety includes which of the following? (Circle the correct answers.)

      (1) Attitude

      (2) Personal safety

      (3) Group safety

      (4) Safety deposit box

      (5) Shop safety

      (6) Clothing and equipment safety

      (7) Hand and power tool safety

2. Point out the importance of good safety attitudes by placing a "✓" in front of each correct statement.

_____ a. The proper attitude is a must in a General Metal Trades shop.

_____ b. Most accidents are caused by other people.

_____ c. Each student should be on guard against accidents at all times.

_____ d. Visiting should be done during shop time because it keeps others alert.

3. Point out the ways you can practice personal safety by placing a "✓" in front of each correct statement below

_____ a. Personal safety involves protecting yourself from injury caused by your own or others' actions

_____ b. Personal safety involves being aware of unsafe conditions and practices

_____ c. Personal safety involves looking after yourself only

_____ d. Personal safety involves protecting others by practicing your own personal safety

4. Explain how you can take part in group safety

# UNIT VI

## GENERAL SAFETY

### TEST--PART 2

1. Select the correct safety rules to be followed in the shop by answering True or False to each of the following statements.

_____ a. Wrestling, throwing objects, and general horse-play are fine shop activities

_____ b. Tools should be cleaned and properly stored

_____ c. Observe all posted safety rules

_____ d. Operate equipment without permission if you know how

_____ e. Report only serious injuries

_____ f. Know the location of fire extinguishers and exits

_____ g. Rings, watches, and other jewelry are dangerous only when welding

_____ h. Oily rags should be kept in a closed metal container

_____ i. Spilled oil and grease should be spread evenly on the floor

_____ j. Paint, thinner, and flammable materials should be placed in the center of the shop so it can air out

_____ k. Do not run in the shop

_____ l. Keep all machines and tools clean and in good working order

_____ m. Use compressed air to clean machines of metal chips and cutting oil

_____ n. Moving very heavy objects by yourself builds back muscles

_____ o. Never operate a machine until all guards are in place

_____ p. Have good ventilation when there is dust and fumes

_____ q. Be alert at all times

_____ r. Report damaged equipment only if it quits running

2. Select the proper clothing and protective equipment to be worn in the shop by placing the number of the correct answer in the blank provided

_____ a. Clothing should fit

(1) loosely

(2) close to the body

(3) several sizes too small

_____ b. To keep hair from getting caught in moving parts, you should wear

(1) a ribbon

(2) an army helmet

(3) a cap

_____ c. When wearing long sleeves in the shop, you should

(1) roll them above your elbows

(2) cut them off at the shoulder

(3) leave the sleeves unbuttoned

_____ d. To protect your eyes, wear

(1) a cardboard shield with holes for your eyes

(2) regular eye glasses

(3) safety glasses

_____ e. To protect your clothes from oil, wear

(1) an apron or shop coat

(2) clothes made from oil rags

(3) heavy armor

_____ f. The best type of shoes to wear in the shop are

(1) tennis shoes

(2) beach shoes

(3) hightopped boots

_____ g. Clothing that would be worn in the welding area is

(1) heavy long sleeved shirt and pants

(2) light tee shirt and shorts

(3) a Sunday suit

_____ h. You should wear gloves when

(1) operating machinery

(2) welding or handling sharp-edged metal

(3) measuring with precision instruments

## UNIT VI

## GENERAL SAFETY

### TEST--PART 3

1. Select the correct safety rules to follow when using hand tools by placing a "✓" in front of each correct statement.

_____ a. Focus your full attention on the work

_____ b. Use the right tool for the right job

_____ c. Learn how to use the tool properly

_____ d. Keep tools in their best condition

_____ e. Keep each tool in its place

_____ f. When using sharp-edged tools, cut toward the body

_____ g. Keep sharp-edged tools away from the edge of a bench or work area

_____ h. Carry sharp-pointed tools with the cutting edge or point down

_____ i. Keep tools sharp and clean

_____ j. Never use a handle on a file

_____ k. Do not strike hardened metal or tools with a hard-faced hammer

_____ l. Avoid mushroomed or battered heads on metal tools by keeping them ground smooth and square

2. Select the correct safety rules to follow when using power tools by answering TRUE or FALSE to each of the following.

_____ a. Be sure all power tools are not grounded

_____ b. Power tools should be inspected and serviced regularly by qualified maintainence personnel

_____ c. Read and understand all of the manufacturer's safety recommendations

_____ d. Be familiar with the operation procedures of the tool

_____ e. Inspect electrical cords to see that they are in good condition

_____ f. Leave electrical cords to see that they are in good condition

_____ g. Take safety guards off when they get in the way.

_____ h. Remove a tie, rings, or a wristwatch, and roll up long sleeves before using power tools.

_____ i. Be sure that your hands are dry.

_____ j. Make all adjustments and inspections with the power OFF and the cable DISCONNECTED.

_____ k. Before connecting to a power source, be sure that the switch is in the ON position.

_____ l. Wear safety goggles and a dust mask when you feel like it.

_____ m. Be sure that the materials being worked are securely clamped and will clear all machine parts when moving.

_____ n. Keep your attention focused on the work.

_____ o. Change in sound during power-tool operation normally indicates everything is working fine.

_____ p. When work is completed, turn off electricity to all power tools.

_____ q. When work is completed, the power tools should be left plugged in.

_____ r. After a tool is disconnected, remove blades, bits, or any other cutter from the tool.

_____ s. Store power tools and blades, bits, or other cutters in their proper places.

_____ t. When a power tool is defective, remove it from service.

## UNIT VI

## GENERAL SAFETY

### TEST--PART 4

1. Select the correct rules associated with fire safety by answering, True or False to each of the following:

_____ a. You should practice fire prevention.

_____ b. To know what type materials are burning in a fire is not important to the person putting out the fire.

_____ c. Give a fire the chance to go out on its own before reporting it.

_____ d. Know how to use a fire extinguisher.

_____ e. When you see a fire, grab the closest fire extinguisher.

_____ f. Know the location of a fire alarm.

_____ g. Only doctors need to know how to treat burns.

_____ h. Keep the shop clean and flammables stored.

_____ i. Know how to leave a building during a fire.

_____ j. Fire drills are for fun.

2. Point out the class of fire according to the material burning by placing the correct number in the blanks.

_____ a. Flammable liquids, such as gasoline, paint, or oil.

_____ b. Ordinary combustibles, such as wood, paper, or cloth.

_____ c. Electrical equipment, such as motors or switches.

1. Class A.
2. Class B.
3. Class C.

3. Point out the types of fire extinguishers and methods of use by writing the correct information from each of the lists below in the blanks provided.

| Classes of fires | To operate | Spray |
|---|---|---|
| A | Squeeze handle | At base of fire |
| B | Turn upside down | Over the fire |
| C | | |

| | Classes | To operate | Spray |
|---|---|---|---|
| a. Foam | ______ | ______________ | __________ |
| b. Carbon dioxide | ______ | ______________ | __________ |
| c. Gas cartridge | ______ | ______________ | __________ |
| d. Water | ______ | ______________ | __________ |
| e. Dry chemical | ______ | ______________ | __________ |

4. Select the correct procedures for evacuating the building in case of a fire by answering True or False to each of the following:

_____ a. The doors and windows should be left open so that firemen may get to the fire easily.

_____ b. Make sure all people are out of the building as you leave.

_____ c. Leave the building through any window or door close by.

_____ d. Know the best route to take when leaving the building.

_____ e. Stand around the building during a fire to see if you can help.

5. Identify the different types of burns and the correct treatment of each by writing the information in the lists below in the correct blanks provided.

| | |
|---|---|
| Blistered skin | Get immediate medical help |
| Charred or seared skin | Apply cold water and sterile gauze |
| Reddened skin | Apply cold water |

| Burn | Appearance of skin | Treatment |
|---|---|---|
| a. Third degree....... | ________________...... | ______________ |
| b. Second degree...... | ________________...... | ______________ |
| c. First degree....... | ________________...... | ______________ |

# UNIT VI

## GENERAL SAFETY

## ANSWERS TO TESTS

### PART 1

1. a. (2) Preventing accidents and injury.

   b. (2) Assures every working person safe and healthful working conditions and preservation of human resources.

      (3) Organizes accident-prevention programs in school shops.

   c. (1) Attitude

      (2) Personal safety

      (3) Group safety

      (5) Shop safety

      (6) Clothing and equipment safety

      (7) Hand and power tool safety

2. a. ✓

   b.

   c. ✓

   d.

3. a. ✓

   b. ✓

   c.

   d. ✓

4. Answer should include information concerning:

   a. The entire class participating in safety.

   b. Facts that every student's actions can be a reaction on you.

   c. Stressing classroom safety to your classmates.

## PART 2

1. a. True
b. True
c. True
d. False
e. False
f. True
g. False
h. True
i. False
j. False
k. True
l. True
m. False
n. False
o. True
p. True
q. True
r. False

2. a. (2)
b. (3)
c. (1)
d. (3)
e. (1)
f. (3)
g. (1)
h. (2)

## PART 3

1. a. ✓
b. ✓
c. ✓
d. ✓
e. ✓
f.
g. ✓
h. ✓
i. ✓
j.
k. ✓
l. ✓

2. a. False
b. True
c. True
d. True
e. True
f. False
g. False
h. True
i. True
j. True
k. False
m. False
n. True
o. False
p. True
q. False
r. True
s. True
t. True

## PART 4

| | | | | |
|---|---|---|---|---|
| 1. | a. | True | f. | True |
| | b. | False | g. | False |
| | c. | False | h. | True |
| | d. | True | i. | True |
| | e. | False | j. | False |

2. a. 2

b. 1

c. 3

3. a. A or B - Turn upside down - Over the fire

b. B or C - Squeeze handle - At base of fire

c. A - Turn upside down - At base of fire

d. A - Squeeze handle - At base of fire

e. A, B or C - Squeeze handle - At base of fire

4. a. False

b. True

c. False

d. True

e. False

5. a. Third degree......Charred or seared skin.....Get immediate medical help

b. Second degree.....Blistered skin.............Apply cold water and steril gauze

c. First degree......Reddened skin..............Apply cold water

# UNIT VII

# METALS AND STEEL PRODUCTION

## UNIT OBJECTIVE

After completing this unit, the student will be able to explain the steel production process and identify the types and characteristics of different metals. The student will also be able to identify types of steels by coding numbers or colors, and the spark test. This knowledge will be evidenced through demonstration and by satisfactorily completing a unit test.

## SPECIFIC OBJECTIVES

After completion of this unit, the student will be able to:

1. Explain the iron and steel production process.
2. Identify the types of metals.
3. Identify the properties of metals.
4. Point out the processes of working steel.
5. Identify steels according to the different coding systems.
6. Identify the types of steels by using the spark test.

# UNIT VII

# METALS AND STEEL PRODUCTION

## SUGGESTED TEACHING ACTIVITIES

I. Objective sheet

  A. Discuss the unit objective with the students.

  B. Discuss each specific objective with the students.

  C. Have the students complete the objectives in the most logical sequence for shop organization.

  D. Add any objectives necessary.

II. Information and assignment sheets

  A. INFORMATION SHEET 1--METALS AND HOW THEY ARE MADE (TRANSPARENCY 1--HOW STEEL IS MADE)

    1. Discuss the process of steel production.

    2. Explain why steels with different alloys are used.

    3. Provide examples of metals with each of the different properties of metal.

    4. Explain how each of the metal working processes can be used in a shop.

    5. Use the following assignment sheets to reinforce this area of information:

      a. ASSIGNMENT SHEET 1--IDENTIFY THE STEEL MAKING PROCESS

        (1) This assignment may be given for an oral quiz for the class.

        (2) Divide the class into two groups to compete in completing the activity.

      b. ASSIGNMENT SHEET 2--METAL PRODUCTS

        (1) Divide the class into small groups to complete the activity.

        (2) Make a master list of products for each area on the board.

c. ASSIGNMENT SHEET 3--IDENTIFYING TYPES OF METALS

(1) Provide pieces of each metal to identify.

(2) Number different metal items in the shop and have students identify the type of metal.

d. ASSIGNMENT SHEET 4--SELECTING PROPERTIES OF METALS

(1) Provide examples of each property of metal for the students to identify.

(2) Have students point out different items in the shop which possess each of the properties.

B. INFORMATION SHEET 2--IDENTIFICATION OF STEELS

1. Explain why steels are classified and coded.

2. Show students color and number coding on steel in stock.

3. Show the following transparencies to stimulate discussion.

a. TRANSPARENCY 1--SPARK TESTS

b. TRANSPARENCY 2--ROLL FORMING STEEL

c. TRANSPARENCY 3--SHAPES OF METAL

4. Have the students complete the following assignments to reinforce this area of information:

a. ASSIGNMENT SHEET 5--IDENTIFYING METALS BY CODING

(1) Add other coding arrangements for faster students

(2) Provide coding on actual metal bars for the students to identify.

b. ASSIGNMENT SHEET 6--IDENTIFYING STEELS BY THE SPARKS

(1) Provide samples of metals to grind for spark identification.

(2) Show the students the differences in the sounds produced by dropping the different steels on concrete.

III. Answers to assignments

(NOTE: Answers may vary, but class participation is more important than specific answers.)

IV. JOB SHEET 1--PERFORM A SPARK TEST

A. Demonstrate the procedures for performing a spark test.

B. Stress proper grinder adjustment and safety procedures.

C. Check the completed chart for accuracy.

V. Test

A. The unit test is divided into two parts.

(NOTE: Each part covers one information sheet.)

B. Various approaches may be used in testing:

1. Give each part of the test after the student has completed studying the information on one information sheet.

2. Give the entire test upon completion of all the information sheets in the unit.

3. Give one or more parts of the test as an additional assignment or to reinforce problem areas of learning.

C. Include test parts corresponding to any information area or sheets added to the unit.

VI. Answers to the test

A. Answers are based on total information covered in the unit.

B. For convenience of grading, make corresponding answer sheets for any additional test parts included.

VII. References

A. Lascoe, Nelson, and Porter. Machineshop Operations and Setups. American Technical Society. Chicago, Illinois. 4th edition, 1973.

B. McCarthy and Smith. Machine Tool Technology. McKnight and McKnight. Bloomington, Illinois. 3rd edition, 1968.

C. Walker, John. Modern Metalworking. Goodheart-Wilcox. South Holland, Illinois, 1976.

# UNIT VII

# METALS AND STEEL PRODUCTION

## INFORMATION SHEET 1--METALS AND HOW THEY ARE MADE

I. Production of iron and steel

  A. Iron ore is the raw material used in the manufacture of iron and steel.

  B. Iron ore can be found in every region of the earth

  C. Iron ore is obtained from two types of mines

    1. Shaft mine--ore is deep in the earth

    2. Open-pit mine--ore lies near the surface of the earth

  D. Iron ore must be refined

    1. The ore is transported from ines to the blast furnaces by rail in freight cars, or by ore-carrying boats

    2. The blast furnace is first step in refining of iron ore

      a. The furnace melts ore to produce pig iron

      (NOTE: It takes 2 tons of ore, 1 ton of coke, ½ ton of limestone, and 3½ tons of air in the blast to produce 1 ton of pig iron.)

      b. The furnace is often referred as hearth

      c. The main purpose of the furnace is to supply pig iron which can be made into steel

      d. Cast iron can also be produced from pig iron

  E. Three different processes are used for the production of steel.

    1. Bessemer process--A steel refining process, which uses air to remove impurities from the molten iron.

    2. Open-hearth process--A steel-making furnace, so-named because the hearth or floor of the furnace is exposed to the flames which melt the steel.

    3. Electric furnace process--A process, used primarily for making high grade steels which uses electrodes for the heat source to melt the steel. Has fewer impurities than other processes.

  F. When molten metal is created with proper requirements, it is poured into molds to form ingots. These ingots are then removed from the molds and rolled or shaped into the steel we know of today.

II. The products which use metals

   A. In homes--appliances, tools, furniture, utilities, jewelry, recreational goods, utensils, food and drink containers

   B. On the farm--tools and farming equipment, fences, wire, and supplies

   C. In industry--production of parts, machinery, and equipment

   D. In transportation--aircraft vehicles, parts, and accessories

   E. In construction--supplies, equipment, and tools

III. Types of metals

   A. Alloy--A mixture of two or more metals

   B. Alloy Steel--A steel alloyed with a small percentage of another metal such as manganese, nickel, and chromium

   C. Aluminum--A silvery-white and very light metal

   D. Base metal--Pure form metals such as tin, copper, or zinc

   E. Brass--An alloy of copper and tin that is bright yellor

   F. Bronze--An alloy of copper and tin that is reddish-gold and harder than brass

   G. Carbon steel--Steel with carbon used as the alloy

   (NOTE: Ranges from low carbon, medium carbon, and high carbon steels.)

   H. Copper--The oldest metal known to man; it is rich reddish-brown in color and is a good conductor of electricity

   I. Ferrous--A metal that contains iron

   J. Gar-alloy--A zinc-base alloy with copper and silver added for strength. It is often used in place of pewter.

   K. German silver--A copper-base alloy with nickel and zinc. Often used for cheaper jewelry

   L. Magnesium--The lightest of structural metals and usually has added alloys for higher strength

   M. Molybdenum--A metallic element used chiefly as an alloy for steel and cast iron to produce a hard steel for machine cutting tools

N. Nickel--A hard white metallic element often used in plating

O. Non-ferrous--A metal that contains No iron

P. Pewter--An alloy of tin, copper, and antimony.

(NOTE: Pewter produced today contains no lead, making it suitable for use in food and drink containers.)

Q. Precious metals--The term for metals used for expensive metals such as gold, silver, and platinum

R. Stainless steel--A steel with a high amount of chromium to resist corrosion

S. Steel--An alloy of iron and carbon or other element

T. Sterling silver--Silver combined with small amount of copper to produce a metal that is easy to work

U. Super alloys--High-temperature metals with high strength

V. Tin--A soft, shiny, silvery metal used as an alloy

W. Tool steel--Steels with a high amount of carbon content for toughness

X. Wrought iron--Almost pure iron, with the carbon and impurities removed

Y. Zinc--A metal used as a protective coating on steel and iron.

(NOTE: Adding this coating is called galvanizing.)

IV. Properties of metals

A. Hardness--Quality of metal that resist bending or denting whel force is applied

B. Brittleness--Quality of metal that allows it to be broken easily

C. Malleability--Quality of metal that allows it to be easily shaped with metal working equipment

D. Ductility--Quality of metal that allows it to be drawn or hammered thin

E. Elasticity--Quality of metal that allows it to stretch and return to the original shape when force is applied

F. Fusibility--Quality of a metal that allows it to pass from a solid to liquid form

G. Machinability--Quality of a metal that allows it to be machined or shaped with metal cutting tools

V. Processes for working steel

   A. Anneal--Softening by heating and slowly cooling to remove stress which is caused by rolling and forging

   B. Cold-drawn--Finishing of steel by drawing or pulling the steel through a series of dies until it is in the proper shape

   C. Cold-finish--Finishing steel to a fine finish while it is in its cold form

   D. Expanded metal--Sheetmetal that has been cut or pressed to a pattern

   E. Hot-rolled--Shaping of steel that is heated to "Red Hot."

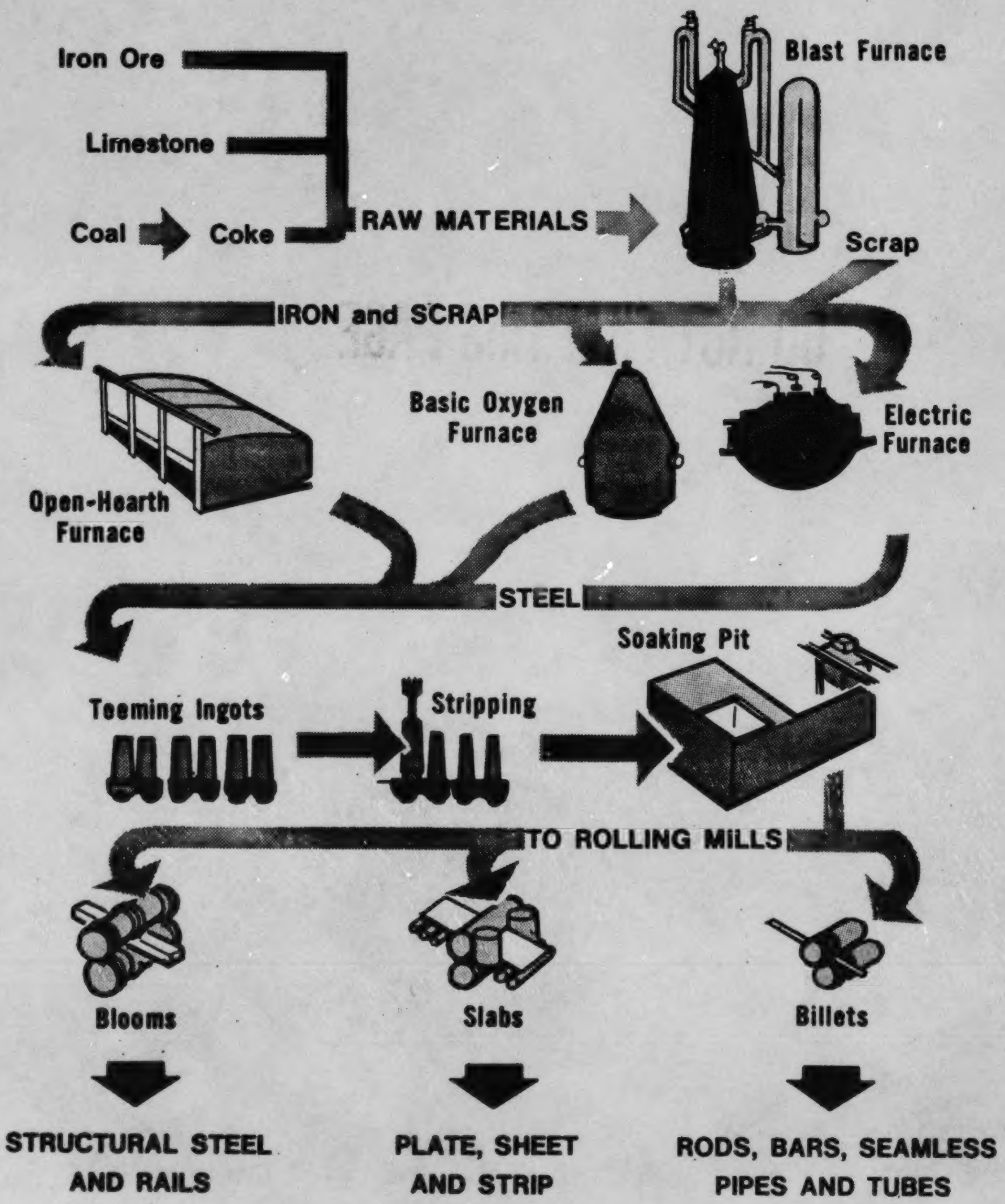
      (NOTE: It can usually be recognized by the black oxide scale caused by the rolling process.)

   F. Heat treating--Hardening of steel by heating and cooling the steel at controlled rates

   G. Tempering--Reheating of hardened steel to low temperatures to relieve hardening stress in the metal and increase toughness.

      (NOTE: Most tools that are hardened have inner stress on the metal and will often crack if they are not tempered.)

# HOW STEEL IS MADE


Iron Ore
Limestone
Coal
Coke
RAW MATERIALS
Blast Furnace
Scrap
IRON and SCRAP
Basic Oxygen Furnace
Electric Furnace
Open-Hearth Furnace
STEEL
Soaking Pit
Teeming Ingots
Stripping
TO ROLLING MILLS
Blooms
Slabs
Billets
STRUCTURAL STEEL AND RAILS
PLATE, SHEET AND STRIP
RODS, BARS, SEAMLESS PIPES AND TUBES

## UNIT VII

## METALS AND STEEL PRODUCTION

### ASSIGNMENT SHEET 1--IDENTIFY THE STEEL MAKING PROCESS

Directions: Match the words on the right with the correct statement by placing each number in the correct blank on the left.

____ A. The raw material used in the production of iron and steel

____ B. The process of removing iron ore from deep within the earth

____ C. Method of transporting iron ore to the blast furnace

____ D. Used to melt iron ore

____ E. Produced from melted iron ore

____ F. Another name for furnace

____ G. Produced from pig iron

____ H. Are rolled into different shapes of steel

____ I. Uses electrodes as a heat source to produce a high-grade steel.

____ J. Process in which air is used to remove impurities from molten iron

____ K. Steel producing process in which the floor of the furnace is exposed to the flames to melt the steel

____ L. Process of removing iron ore from the surface of the earth

1. Open-hearth
2. Hearth
3. Pig iron
4. Iron ore
5. Open-pit mining
6. Bessemer
7. Ingots
8. Shaft mining
9. Electric furnace process
10. Cast iron
11. Rail
12. Blast furnace

## UNIT VII

## METALS AND STEEL PRODUCTION

### ASSIGNMENT SHEET 2--METAL PRODUCTS

Directions: Write five ways that metal is being used in the home, on the farm , in industry, in transportation, and in construction.

A. Metals in the home:

1.
2.
3.
4.
5.

B. Metals on the farm:

1.
2.
3.
4.
5.

C. Metals in industry:

1.
2.
3.
4.
5.

D. Metals in transportation:

1.
2.
3.
4.
5.

E. Metals in construction:

1.
2.
3.
4.
5.

# UNIT VII

# METALS AND STEEL PRODUCTION

## INFORMATION SHEET 2--IDENTIFICATION OF STEELS

I. Numerical system--Developed by American Iron and Steel Institute (AISI)

   A. Letter prefixes--Identifies the process used in making the steel.

      1. A--basic open-hearth alloy steel

      2. B--acid Bessemer carbon steel

      3. C--basic open-hearth carbon steel

      4. D--acid open-hearth steel

      5. E--electric furnace steel

      6. F--hardened steel

      (NOTE: Used after complete number)

   B. Numerical series--Identifies carbon and alloy steel contents

      1. First number indicator--Identifies kind of steel

         a. 1--carbon steel

         b. 2--nickel steel

         c. 3--nickel-chromium steel

         d. 4--molybdenum steel

         e. 5--chromium steel

      2. Second number indicator--Approximate percentage of alloy elements in steel

      3. Last two number indicators--Four numerical series indicate the average carbon content range

      Example: AISI-C1020 indicates carbon steel with 20 points or 0.20% carbon

II. Society of Automotive Engineers (S.A.E.)

   (NOTE: Identifies steel with the same numerical system as the AITI system without the letter designation.)

III. Color code--Another identification method using various colors of points

   A. Each type of steel is identified by a different color

   B. Location of color code

      1. A steel bar over 1" has code painted on end of bar

      2. A steel bar under 1" has code painted on end of bar on an attached tag

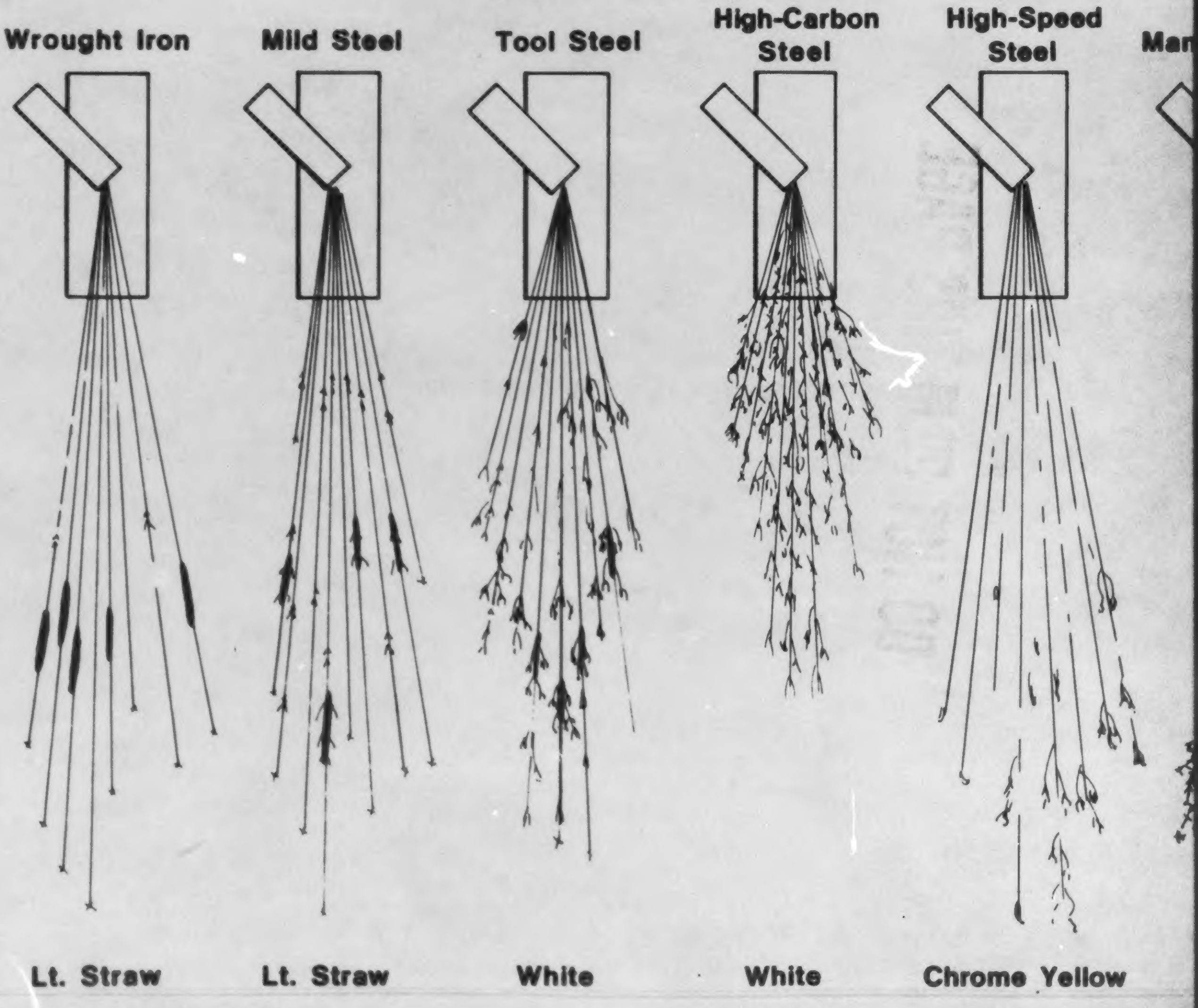
IV. Spark test--A method that can be used to determine grade of steel

   A. The material is placed against the grinding wheel

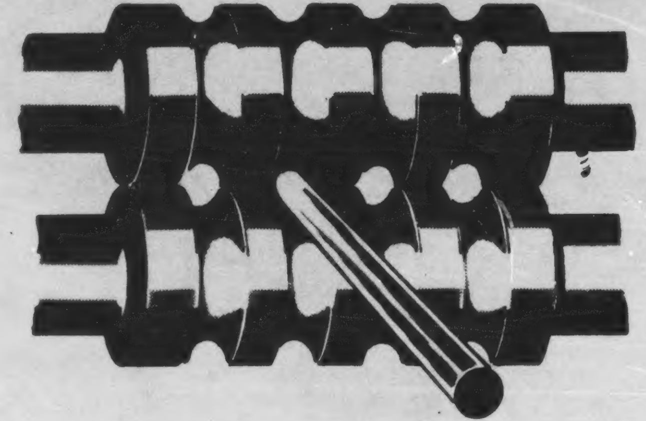
   B. The appearance of the sparks produced indicates the type of steel

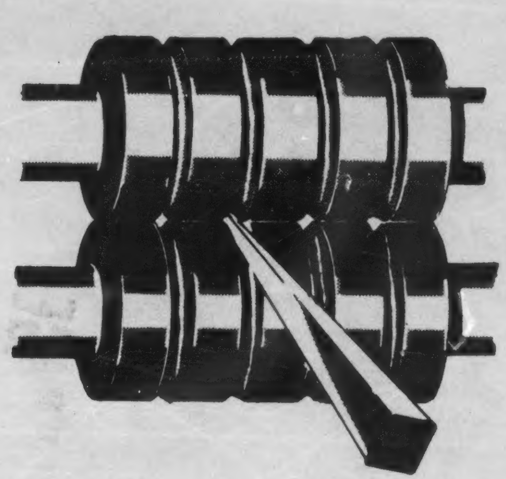
| Colors | Types of Steel | Types of Sparks |
|---|---|---|
| Light Straw | Wrought Iron | Long, Very Few, White, Forked Sparks |
| Light Straw | Mild Steel | Long, Few, White, Forked Sparks |
| White | Tool Steel | Medium, Very Many, Fine Sparks |
| White | High-Carbon Steel | Short, Very Many, Fine, Forked Sparks |
| Chrome Yellow | High-Speed Steel | Long, Few, Forked Sparks |
| White | Manganese | Long, Very Few, Fine, Forked Sparks |

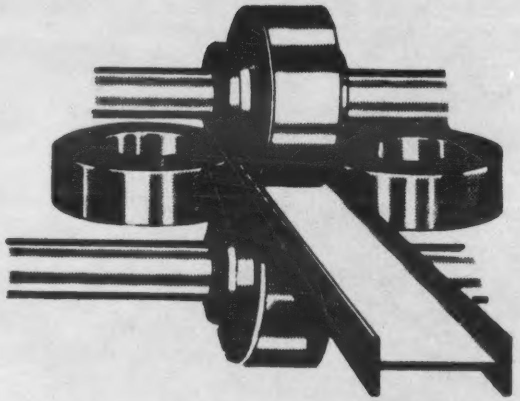
# SPARK TESTS

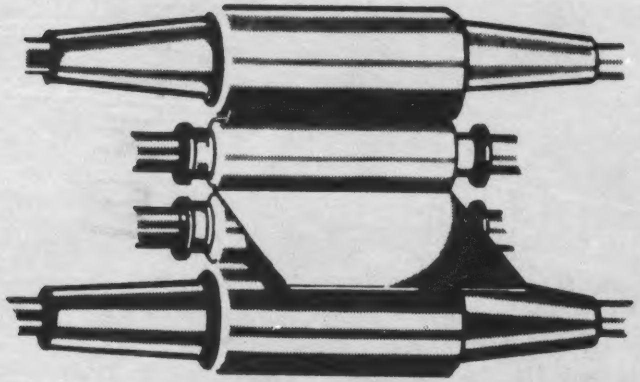

Wrought Iron
Mild Steel
Tool Steel
High-Carbon Steel
High-Speed Steel
Man
Lt. Straw
Lt. Straw
White
White
Chrome Yellow

# ROLL-FORMING STEEL

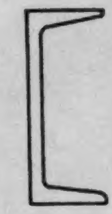


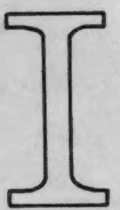


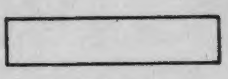




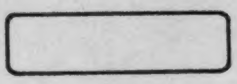
# SHAPES OF METAL

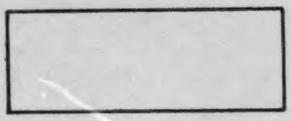

Channel

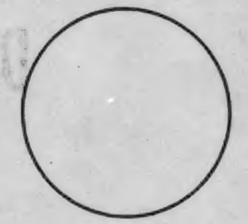

I-Beam

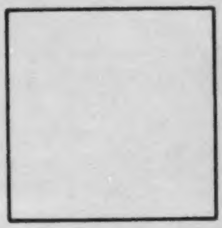

More Than ¼"

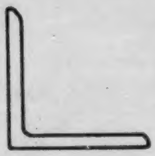
Plate

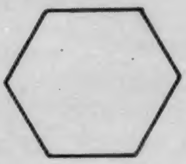

Band

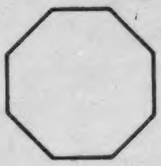

Flat

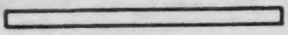

Round


Square

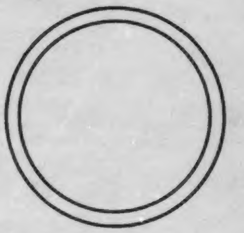

Angle

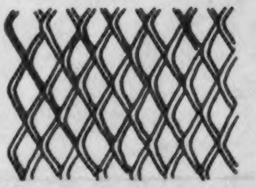

Hexagon

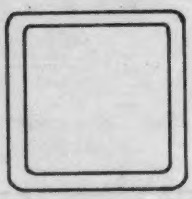

Octagon

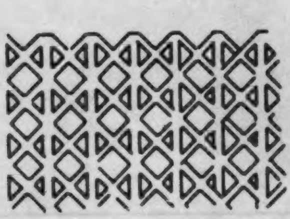

LessThan ¼"

Sheet


Pipe


Expanded (Sheet)


Tubing


Perforated
Decorative Sheet

## UNIT VII

## METALS AND STEEL PRODUCTION

### ASSIGNMENT SHEET 3--IDENTIFYING TYPES OF METALS

Directions: Point out the description of each type of metal listed below by writing the number of the correct description in the blanks on the left.

____ A. Alloy

____ B. Brass

____ C. Ferrous

____ D. German silver

____ E. Magnesium

____ F. Molybdenum

____ G. Pewter

____ H. Stainless steel

____ I. Steel

____ J. Zinc

1. A metal that contains iron
2. Used in galvanizing
3. The lightest of structural metals
4. A steel that contains a high amount of chromium to resist corrosion
5. An alloy of tin, copper, and antimony
6. A copper-base alloy with nickel and zinc that is used in cheaper jewelry
7. A mixture of two or more metals
8. An alloy of copper and tin that is bright yellow
9. An alloy of iron and carbon or some other element
10. A metallic element used chiefly as an alloy for steel and cast iron to produce a hard steel for machine cutting tools

____ K. Aluminum

____ L. Bronze

____ M. Carbon steel

____ N. Copper

____ O. Gar-alloy

____ P. Nickel

____ Q. Sterling silver

____ R. Tin

____ S. Tool steel

____ T. Wrought Iron

11. An alloy of copper and tin that is reddish-gold and harder than brass

12. Steel with a high amount of carbon content for toughness

13. A soft, shiny, silvery metal used as an alloy

14. A zinc-base alloy with copper and silver that is used in place of pewter

15. Almost pure iron with the carbon removed

16. Steel with carbon used as the alloy

17. A silvery white metal that is very light

18. A hard, white metallic element used in plating

19. The oldest metal known to man which is reddish brown and a good conductor of electricity

20. Silver combined with small amounts of copper to produce a metal that is easy to work

## UNIT VII

## METALS AND STEEL PRODUCTION

### ASSIGNMENT SHEET 4--SELECTING PROPERTIES OF METALS

Directions: Identify each of the properties of metals described below by writing the terms listed below in the correct blank.

Brittleness
Ductility
Elasticity
Fusibility
Hardness
Machinability
Malleability

____________________ A. Quality of metal that allows it to resist bending or denting when force is applied

____________________ B. Quality of metal that allows it to be easily broken

____________________ C. Quality of metal that allows it to be easily shaped with metal working equipment

____________________ D. Quality of metal that allows it to be drawn or hammered thin

____________________ E. Quality of metal that allows it to stretch and return to the original shap when force is applied

____________________ F. Quality of a metal that allows it to pass from solid to liquid form

____________________ G. Quality of a metal that allows it to be machined or shaped with metal cutting tools

## UNIT VII

## METALS AND STEEL PRODUCTION

### ASSIGNMENT SHEET 5--IDENTIFYING METALS BY CODING

Directions: Identify the types of metals from the numbers circled in each metal identification code or color listed below. Use the chart shown below.

| | Coding | Code Meaning |
|---|---|---|
| A. | Ⓒ1020 | |
| B. | Red and blue | |
| C. | ③215 | |
| D. | Ⓐ4130 | |
| E. | 51⑳ | |
| F. | 1⓪10 | |
| G. | Black | |
| H. | ②015 | |
| I. | Brown | |
| J. | 11⑫ | |

| LETTER PREFIXES | |
|---|---|
| **A** | BASIC OPEN-HEARTH ALLOY STEEL |
| **B** | ACID BESSEMER CARBON STEEL |
| **C** | BASIC OPEN-HEARTH CARBON STEEL |
| **D** | ACID OPEN-HEARTH STEEL |
| **E** | ELECTRIC FURNACE STEEL |
| **F** | HARDENED STEEL |

| NUMBER SERIES | |
|---|---|
| FIRST NUMBER | |
| **1** | carbon steel |
| **2** | nickel steel |
| **3** | nickel-chromium steel |
| **4** | molybdenum steel |
| **5** | chromium steel |
| SECOND NUMBER | percent of alloy |
| LAST TWO NUMBERS | average carbon content |

| COLOR CODE | | | | | |
|---|---|---|---|---|---|
| S.A.E. Number | Type of Metal | Color Code | S.A.E. Number | Type of Metal | Color Code |
| 1010 | Carbon Steel | White | 2315 | Nickel Steel | Red & Blue |
| 1020 | Carbon Steel | Brown | 2340 | Nickel Steel | Red & Green |
| 1045 | Carbon Steel | Orange | 3115 | Nickel-Chromium Steel | Blue & Black |
| 1112 | Free Cutting Steel | Yellow | 3215 | Nickel-Chromium Steel | Blue & Purple |
| 1120 | Free Cutting Steel | Yellow & Brown | 4130 | Molybdenum Steel | Green & White |
| 2015 | Nickel Steel | Red & Brown | 5120 | Chromium Steel | Black |

## UNIT VII

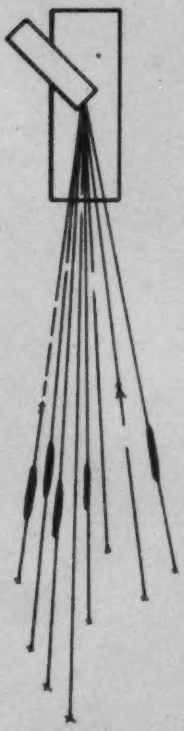
## METALS AND STEEL PRODUCTION

### ASSIGNMENT SHEET 6--IDENTIFYING STEELS BY THE SPARKS

Directions: Identify the type of metal that would produce sparks similar to each illustrated below. Use the following list of metals for reference.

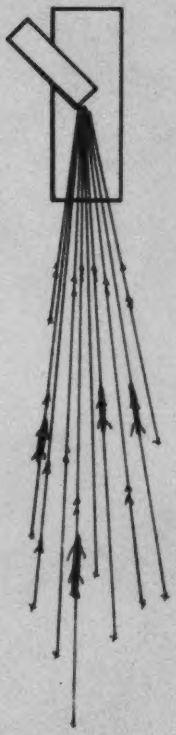
Manganese Steel
High Speed Steel
Wrought Iron
Tool Steel
Mild Steel
High Carbon Steel

**A.** ____________



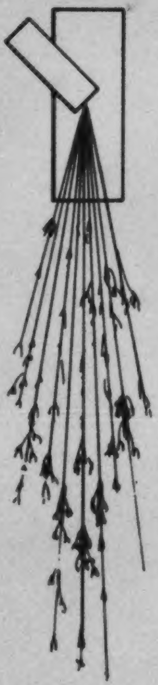
**Lt. Straw**

**B.** ____________



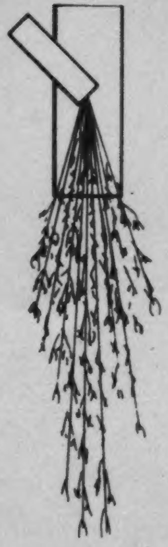
**Lt. Straw**

**C.** ____________



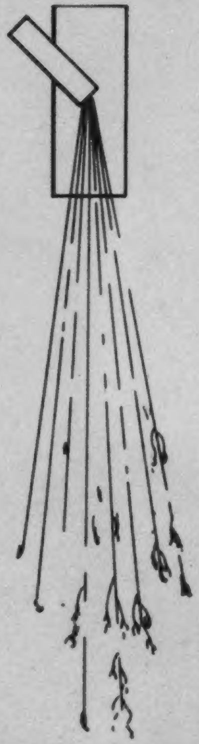
**White**

**D.** ____________



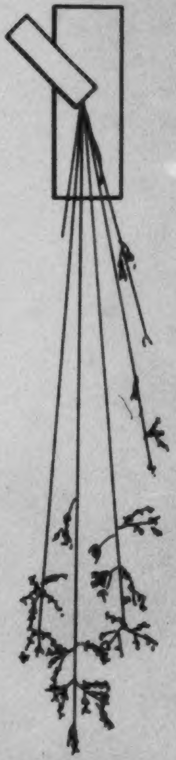
**White**

**E.** ____________



**Chrome Yellow**

**F.** ____________



**White**

# UNIT VII

## METALS AND STEEL PRODUCTION

## ANSWERS TO ASSIGNMENT SHEETS

### Assignment 1

A. 4
B. 8
C. 11
D. 12
E. 3
F. 2
G. 10
H. 7
I. 9
J. 6
K. 1
L. 5

### Assignment 2

Evaluated to the satisfaction of the instructor

### Assignment 3

A. 7
B. 8
C. 1
D. 6
E. 3
F. 10
G. 5
H. 4
I. 9
J. 2
K. 17
L. 11
M. 16
N. 19
O. 14
P. 18
Q. 20
R. 13
S. 12
T. 15

### Assignment 4

A. Hardness
B. Brittleness
C. Malleability
D. Ductility
E. Elasticity
F. Fusibility
G. Machinability

Assignment 5

A. basic open hearth carbon steel
B. nickel steel
C. nickel-chromium steel
D. basic open-hearth alloy steel
E. .20% carbon content
F. no alloy content
G. chromium steel
H. nickel steel
I. carbon steel
J. .12% carbon content

Assignment 6

A. Wrought iron
B. Mild steel
C. Tool steel
D. High carbon steel
E. High-speed steel
F. Manganese steel

## UNIT VII

## METALS AND STEEL PRODUCTION

### JOB SHEET 1--PERFORM A SPARK TEST

I. Tools and materials needed:

- A. Safety goggles or face shield
- B. Bench grinder
- C. Metal samples

  (NOTE: Have your instructor assist you in locating these metals.)

  1. Mild steel
  2. Carbon steel
  3. Tool steel
  4. High-speed steel
  5. Copper
- D. Pencil and paper

II. Procedure:

(CAUTION: Keep hands away from grinding wheel.)

- A. Put on safety goggles or face shield.
- B. Adjust the proper clearance of the tool rest

  (NOTE: Proper clearance is approximately 1/8 inch from the grinding wheel.)

C. Turn on the grinder

(NOTE: Allow it to develop the full speed (RPM) before grinding.)

D. Place a metal sample lightly against grinding wheel

E. Repeat the process for each metal sample

(NOTE: Use an equal amount of pressure for each sample.)

F. Observe and record resulting spark information for each metal sample

(NOTE: You may need to grind each metal sample once before recording the identification, so that you may compare the sparks.)

1. Color of Spark
    a. Close to wheel
    b. Near the end of stream
2. Length of Stream
3. Quantity of Sparks
    a. many
    b. few
    c. very few
    d. none
4. Nature of Sparks
    a. forked
    b. fine, repeating
5. Volume of Spark
    a. large
    b. small
    c. extremely small

G. Turn in the following information for evaluation.

| Metal | Color of Spark | | Quantity of sparks | Nature of sparks | Volume of spark stream |
|---|---|---|---|---|---|
| | Close to wheel | Near end of stream | | | |
| Mild steel | | | | | |
| Carbon steel | | | | | |
| Tool steel | | | | | |
| High-speed steel | | | | | |
| Copper | | | | | |

## UNIT VII

## METALS AND STEEL PRODUCTION

### TEST--PART 1

1. Explain the iron and steel production process by writing the number of the answer that best completes each statement in the blank provided.

_____ a. The raw material used in manufacturing iron and steel is:

(1) water

(2) iron ore

(3) limestone rock

_____ b. The type of iron ore mining that takes ore from the surface of the earth is:

(1) shaft mining

(2) surface mining

(3) open-pit mining

_____ c. The furnace melts iron ore to produce:

(1) pig iron

(2) silver

(3) hot-rolled steel

_____ d. The furnace is often referred to as a:

(1) hearth

(2) hot box

(3) oven

_____ e. Molten metal is usually:

(1) poured into molds the shape of the finished product.

(2) poured into ingots which are rolled into shape of the product.

(3) allowed to age before using.

_____ f. A process of using air to remove impurities when refining steel is called:

(1) open-hearth

(2) electric furnace

(3) Bessemer

_____ g. The process of making steel where the floor of the furnace is exposed to flames to melt the steel is called the:

(1) open-hearth

(2) electric furnace

(3) Bessemer

_____ h. The process of making high-grade steel by using electrodes as a heat source is called:

(1) open-hearth

(2) electric furnace

(3) Bessemer

2. Identify the types of metals by writing the number of each definition in the correct blank on the left.

| | | |
|---|---|---|
| _____ | a. Alloy | 1. Steels with a high amount of carbon content for toughness. |
| _____ | b. Base metal | 2. A steel with a high amount of chromium to resist corrosion. |
| _____ | c. Brass | 3. An alloy of iron and carbon or other alloying element. |
| _____ | d. Carbon steel | 4. An alloy of copper and tin that is bright yellow. |
| _____ | e. Ferrous | 5. A mixture of two or more metals. |
| _____ | f. Non-ferrous | 6. The term used for expensive metals such as gold and silver. |
| _____ | g. Precious metal | 7. A steel with carbon used at the alloy. |
| _____ | h. Stainless steel | 8. A metal that contains iron. |
| _____ | i. Steel | 9. A metal that contains no iron. |
| _____ | j. Tool steel | 10. Pure forms of metals such as tin, copper, or zinc. |

3. Identify the properties of metals by writing the number of each term on the right in the correct blank on the left.

| | | |
|---|---|---|
| _____ | a. Ability of metal to resist bending or denting when force is applied. | 1. Brittleness |
| _____ | b. Ability of metal to easily be broken. | 2. Ductility |
| _____ | c. Ability of metals to be easily shaped with metal working equipment. | 3. Elasticity |
| _____ | d. Ability of metal to be drawn or hammered thin. | 4. Fusibility |
| _____ | e. Ability of a metal to stretch and return to the original shape when force is applied. | 5. Hardness |
| _____ | f. Ability of a metal to pass from a solid to a liquid. | 6. Machinability |
| _____ | g. Ability of a metal to be machined. | 7. Malleability |

4. Point out the processes of working steel by writing each term from the list below in the correct blank.

Anneal
Cold-drawn
Cold finish
Expanded metal
Hot-rolled
Heat treating
Tempering

__________________ a. Shaping of steel that is red hot.

__________________ b. Finishing steel to a fine finish while it is in its cold form.

__________________ c. Softening by heating and slowly cooling to remove stress which is caused by rolling and forging.

__________________ d. Preheating of hardened steel to a low temperature to relieve hardening strains in the metal and increase toughness.

__________________ e. Finishing of steel by drawing or pulling the steel through a series of dies until it is in its proper shape.

__________________ f. Hardening of steel by heating and cooling the steel at controlled rates.

__________________ g. Sheet metal that has been cut or pressed to a pattern.

## UNIT VII

## METALS AND STEEL PRODUCTION

### TEST--PART 2

1. Identify steels according to the different coding systems by writing the type of steel for each part of the coding numbers circled below. Use the charts on the following page for coding identification.

**Steel coding numbers** — **Steel identification**

a. A4130
A -
4 -
1 -
30 -

b. B1112
B -
1 -
1 -
12 -

c. C1090
C -
1 -
0 -
90 -

d. 5120
5 -
1 -
20 -

e. E5140
E -
5 -
1 -
40 -

## STEEL IDENTIFICATION CODING CHARTS

| LETTER PREFIXES | |
|---|---|
| **A** | BASIC OPEN-HEARTH ALLOY STEEL |
| **B** | ACID BESSEMER CARBON STEEL |
| **C** | BASIC OPEN-HEARTH CARBON STEEL |
| **D** | ACID OPEN-HEARTH STEEL |
| **E** | ELECTRIC FURNACE STEEL |
| **F** | HARDENED STEEL |

**NUMBER SERIES**

FIRST NUMBER

- **1** carbon steel
- **2** nickel steel
- **3** nickel-chromium steel
- **4** molybdenum steel
- **5** chromium steel

SECOND NUMBER

percent of alloy

LAST TWO NUMBERS

average carbon content

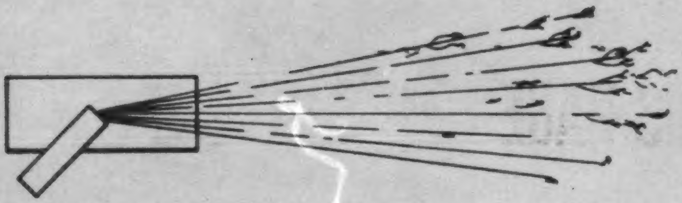
**COLOR CODE**

| S.A.E. Number | Type of Metal | Color Code | S.A.E. Number | Type of Metal | Color Code |
|---|---|---|---|---|---|
| 1010 | Carbon Steel | White | 2315 | Nickel Steel | Red & Blue |
| 1020 | Carbon Steel | Brown | 2340 | Nickel Steel | Red & Green |
| 1045 | Carbon Steel | Orange | 3115 | Nickel-Chromium Steel | Blue & Black |
| 1112 | Free Cutting Steel | Yellow | 3215 | Nickel-Chromium Steel | Blue & Purple |
| 1120 | Free Cutting Steel | Yellow & Brown | 4130 | Molybdenum Steel | Green & White |
| 2015 | Nickel Steel | Red & Brown | 5120 | Chromium Steel | Black |

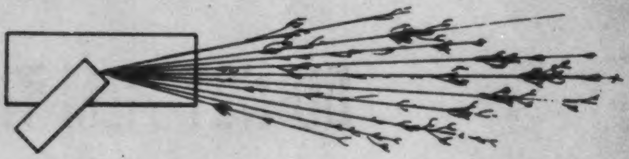
| | Steel coding colors | Steel identification |
|---|---|---|
| f. | White | |
| g. | Yellow | |
| h. | Red & brown | |
| i. | Blue & purple | |
| j. | Black | |

2. Identify the types of steels by using the spark test pictured below. Write the name of the steels listed below in the correct blanks.

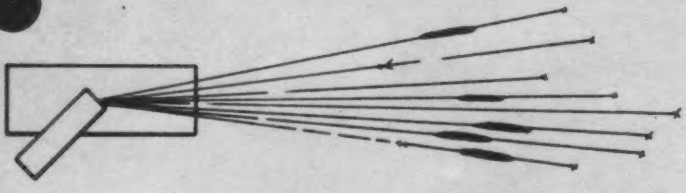
| | |
|---|---|
| Wrought iron | High-carbon steel |
| Mild steel | High-speed steel |
| Tool steel | Manganese steel |



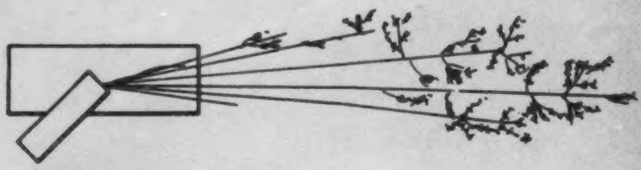
a. ______________________________



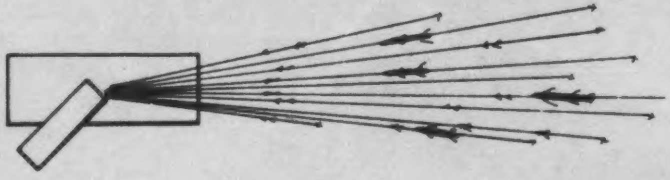
b. ______________________________



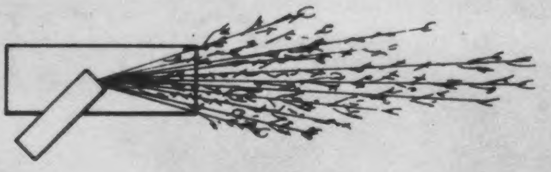
c. ______________________________



d. ______________________________



e. ______________________________



f. ______________________________

## UNIT VII

## METALS AND STEEL PRODUCTION

## ANSWERS TO TEST

### PART 1

1. a. 2
   b. 3
   c. 1
   d. 1
   e. 2
   f. 3
   g. 1
   h. 2

2. a. 5
   b. 10
   c. 4
   d. 7
   e. 8
   f. 9
   g. 6
   h. 2
   i. 3
   j. 1

3. a. 5
   b. 1
   c. 7
   d. 2
   e. 3
   f. 4
   g. 6

4. a. Hot-rolled
   b. Cold finish
   c. Anneal
   d. Tempering
   e. Cold drawn
   f. Heat treating
   g. Expanded metal

## PART 2

1. a. A - basic open-hearth alloy steel

4 - molybdenum steel

1 - 1% alloys elements

30

b. B - acid Bessemer carbon steel

1 - carbon steel

1 - 1% alloy elements

12 - .12% carbon content

c. C - basic open-hearth carbon steel

1 - carbon steel

0 - 0% alloy elements

90 - 90% carbon content

d. 5 - chromium steel

1 - 1% alloy elements

20 - .20% carbon content

e. E - electric furnace steel

5 - chromium steel

1 - 1% alloy elements

40 - .40% carbon content

f. carbon steel

g. free cutting steel

h. nickel steel

i. nickel chromium steel

j. chromium steel

# UNIT VIII

# SHOP MATH

## UNIT OBJECTIVE

After completion of this unit, the student will be able to use the correct math terminology in completing simple shop math involving whole numbers, fractions, metric measurement, angles, and circles. This knowledge will be evidenced through demonstration and by satisfactorily completing a unit test.

## SPECIFIC OBJECTIVES

After completion of this unit, the student will be able to:

1. Match the basic math terms to the correct definition.
2. Identify the three standard U. S. lengths of measurement.
3. Select the proper terms used in working math problems.
4. Add and subtract fractions.
5. Multiply fractions.
6. Divide fractions.
7. Identify the three base metric measurements.
8. Point out the correct metric prefixes for multiples and divisions of base measurement.
9. Select the correct multiple or divisions of the meter.
10. Convert U.S. measurements into metric.
11. Identify the parts of a circle.
12. Point out the correct measurement of angles.

## UNIT VIII

## SHOP MATH

### SUGGESTED TEACHING PROCEDURES

I. Objective sheet

- A. Discuss the unit objective with the students.
- B. Discuss each specific objective with the students.
- C. Have the students complete the objectives in the most logical sequence for shop organization.
- D. Add any objectives necessary.

II. Information and assignment sheets

- A. INFORMATION SHEET 1--BASIC MATH
  - 1. Explain how shop math will be used throughout the year.
  - 2. Discuss the importance of learning shop math for employment.
  - 3. Discuss the terms used in math problems. (TRANSPARENCY 1--MATH PROBLEM TERMS)
  - 4. Use the following assignment sheets to reinforce this area of information.

    (NOTE: If these assignments are too elementary for some students, use activities in the Vocational Related Activities sheets.--see references.)

    - a. ASSIGNMENT SHEET 1--ADDING NUMBERS

      (NOTE: Explain how to add numbers on the chalkboard before beginning this assignment.)

    - b. ASSIGNMENT SHEET 2--SUBTRACTING NUMBERS

      (NOTE: Explain how to subtract numbers on the chalkboard before beginning this assignment.)

    - c. ASSIGNMENT SHEET 3--MULTIPLYING NUMBERS

      (NOTE: Explain how to multiply numbers on the chalkboard before beginning this assignment.)

d. ASSIGNMENT SHEET 4--DIVIDING NUMBERS

(NOTE: Explain how to divide numbers on the chalkboard before beginning this assignment.)

B. INFORMATION SHEET 2--FRACTIONS

1. Explain the use of fractions in the shop.

2. Explain how to change fractions to decimals.

(NOTE: Provide wall charts with decimal equivalents for the students.)

3. Use ASSIGNMENT SHEET 5--SOLVING PROBLEMS WITH FRACTIONS to reinforce this area of information.

(NOTE: Explain how to solve problems with fractions on the chalkboard before beginning this assignment.)

C. INFORMATION SHEET 3--METRIC MEASUREMENT

1. Discuss the potential change of measurement in shops from U.S. to metric.

2. Explain how U.S. measurement is changed to metric. (TRANSPARENCY 2--EQUIVALENTS CONVERSION CHARTS)

3. Use the following assignment sheets to reinforce this area of information.

a. ASSIGNMENT SHEET 6--METRIC MEASURES

(NOTE: Provide equivalents charts for students to use in completing this assignment.)

b. ASSIGNMENT SHEET 7--CHANGING U.S. TO METRIC

(NOTE: Allow students to use the charts in Information Sheet 3 to complete the assignment.)

c. ASSIGNMENT SHEET 8--SELECTING METRIC MEASUREMENT

(1) Discuss how Metric measurements are used in the U.S. today.

EXAMPLE: gasoline sold by the liter
speed measured by kilometers per hour
precision measurement by millimeters

(2) Have the students list other things that are measured in Metric measurement.

D. INFORMATION SHEET 4--ANGLES AND CIRCLES

1. Discuss the use of angles and circles in a shop. (TRANSPARENCY 3--ANGLES)

2. Explain how angles can be measured. (TRANSPARENCY 4--MEASURING WITH A PROTRACTOR)

3. Discuss the parts of a circle and how they apply to the shop. (TRANSPARENCY 5--PARTS OF A CIRCLE)

4. Use the following assignment sheets to reinforce this area of information.

    a. ASSIGNMENT SHEET 9--CIRCLES

    (NOTE: Provide compasses and rules for the students to use in completing this assignment.)

    b. ASSIGNMENT SHEET 10--ANGLES

    (NOTE: Provide protractors for the students to use to complete this assignment.)

III. Answers to assignments.

(NOTE: Answers may vary if the students round off or carry out the different decimal places.)

IV. Test

A. The unit test is divided into four parts.

(NOTE: Each part covers one information sheet.)

B. Various approaches may be used in testing:

1. Give each part of the test after the student has completed studying the information on one information sheet.

2. Give the entire test upon completion of all the information sheets in a unit.

3. Give one or more parts of the test as an additional assignment or to reinforce problem areas of learning.

V. Answers to test

A. Answers are based on total information covered in the unit.

B. For convenience of grading, make corresponding sheets for any test parts included.

## VI. References

A. CVAE Academic Teacher's Guide fcr Math.
Occupational Curriculum Laboratory, East Texas State University, Commerce, Texas, 75428.

B. CVAE Vocational Related Activity Sheets for Math.
Occupational Curriculum Laboratory, East Texas State University, Commerce, Texas. 75428.

C. Discover Metrics. Beloit Tool Corporation.
Swaim Publishing Company, Box 248, Roscoe, Illinois, 61073.

D. Metrics for Architectural, Civil, and Mechanical Drafting.
The Center for Vocational Education. The Ohio State University, 1960 Kenny Road, Columbus, Ohio, 43210.

# UNIT VIII

# SHOP MATH

## INFORMATION SHEET 1--BASIC MATH

I. Basic math terms

A. Whole number--Any natural number that is not broken into parts.

EXAMPLE: 1, 2, 3, 4, . . . 11, 12, 13, 14, and others.

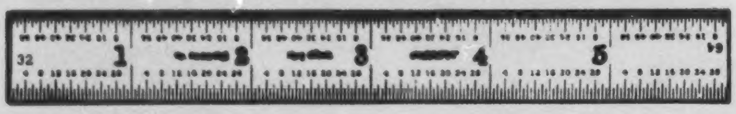
B. Fraction--A part of a whole number or one.

EXAMPLE: 1/16, 1/8, 1/4, 1/2

C. Dimension--The distance or size from one point to another point.

D. Graduation--The mark on a measuring tool indicating size or degrees.

E. Rule--A semi-precision measuring instrument graduated in fractional or decimal parts of an inch.



F. Measure--To find the amount, size, or length of something.

(NOTE: Measurement can include volume, weight, length, etc.)

EXAMPLE: A piece of metal may weigh 50 pounds, be 2 inches in diameter, and 2 feet long.

G. Error--A mistake in reading or figuring total measurement.

H. Decimal--A proper fraction with the bottom number (denominator) being 10, 100, or 1000.

EXAMPLES: $.2$ or $\frac{2}{10}$

$.25$ or $\frac{25}{100}$

$.255$ or $\frac{255}{1000}$

II. Standard measurement

   A. Yard--A length of measurement containing 36 inches or 3 feet.

   B. Foot--A length of measurement containing twelve inches.

   C. Inch--The smallest whole unit of measurement commonly used.

   (NOTE: Any measurement less than one inch is a fraction.)

III. Math problem terms

   A. Addition--Putting two or more numbers together to find a total.

      1. Addend--A number to be added to another.

      2. Sum (total)--The answer from adding two or more numbers.

   B. Subtraction--Taking one number from another to obtain a remainder (or difference).

      1. Minuend--The top number when subtracting.

      2. Subtrahend--The bottom number when subtracting.

      3. Difference (remainder)--The answer when subtracting.

   C. Multiplication--Adding a number to itself a certain number of times.

      1. Multiplicand--The top number when multiplying.

      2. Multiplier--The bottom number when multiplying.

      3. Product--The answer when multiplying.

   D. Division--Find out how many of one number there are in another number.

      1. Dividend--Number to be divided.

      2. Divisor--Number that does the dividing.

      3. Quotient--The answer as a result of dividing.

   E. Fraction--A part of a whole number or one.

      1. Numerator--The top number of a fraction.

      2. Denominator--The bottom number of a fraction

   F. Improper fraction--A fraction with the numerator larger than the denominator

# MATH PROBLEM TERMS

## ADDITION

| | |
|---|---|
| 15 | |
| + 10 | Addend |
| 25 | Sum |

## SUBTRACTION

| | |
|---|---|
| 12 | Minuend |
| − 10 | Subtrahend |
| 2 | Difference |

## MULTIPLICATION

| | |
|---|---|
| 5 | Multiplicand |
| × 4 | Multiplier |
| 20 | Product |

## DIVISION

| | | | |
|---|---|---|---|
| | | 10 | Quotient |
| Divisor | 15 | 150 | Dividend |
| | | 15 | |
| | | 0 | |
| | | 0 | |

## FRACTION

| | |
|---|---|
| 3 | Numerator |
| 4 | Denominator |

## IMPROPER FRACTION

| | |
|---|---|
| 5 | Numerator |
| 4 | Denominator |

## UNIT VIII

## SHOP MATH

### ASSIGNMENT SHEET 1--ADDING NUMBERS

Directions: The following problems deal with the addition of numbers. Complete each of the problems and turn in the sheet to your instructor.

A. Addition of whole numbers

EXAMPLES: $\begin{array}{r} 4 \\ \underline{+5} \\ 9 \end{array}$ $\quad 12 + 14 = 26$

1. $$\begin{array}{rrrrr} 3 & 8 & 12 & 16 & 84 \\ \underline{+5} & \underline{+4} & \underline{+12} & \underline{+15} & \underline{+16} \end{array}$$

2. 2 + 4 + 6 = $\qquad$ 16 + 42 + 5 =

5 + 8 + 12 = $\qquad$ 11 + 101 + 60 =

10 + 12 + 14 =

3. $$\begin{array}{rrrrr} & & & & 6{,}732 \\ 50 & 112 & 1{,}100 & 5{,}284 & 521 \\ 80 & 67 & 584 & 3{,}123 & 643 \\ \underline{+90} & \underline{+95} & \underline{+\ 323} & \underline{+\ 6{,}324} & \underline{+\ 1{,}964} \end{array}$$

B. Addition of decimals

EXAMPLES: $$\begin{array}{rrrrr} .1 & .5 & .25 & .94 & .255 \\ \underline{+\ .6} & \underline{+\ .7} & \underline{+\ .16} & \underline{+\ .38} & \underline{+\ .006} \\ .7 & 1.2 & .41 & 1.32 & .261 \end{array}$$

1. $$\begin{array}{rrrrr} .5 & .12 & .35 & .50 & .500 \\ \underline{+\ .3} & \underline{+\ .10} & \underline{+\ .66} & \underline{+\ .321} & \underline{+\ .625} \end{array}$$

2. $$\begin{array}{rrrr} & & & 2.125 \\ 4.5 & 25.10 & 30.525 & 3.375 \\ \underline{+\ 4.6} & \underline{+\ 50.25} & \underline{+\ \ 3.875} & \underline{+\ 25.650} \end{array}$$

3. 1.5 + 17.8 + 3.4 =

22.25 + 3.75 + 1.04 =

3.255 + 1.125 + 3.005 =

# UNIT VIII

# SHOP MATH

## ASSIGNMENT SHEET 2--SUBTRACTING NUMBERS

Directions: The following problems deal with the subtraction of of numbers. Complete each of the problems and turn in the sheet to your instructor.

### A. Subtraction of whole numbers

1.

$$\begin{array}{rrrrr} 5 & 12 & 25 & 85 & 100 \\ \underline{-3} & \underline{-\ 6} & \underline{-13} & \underline{-12} & \underline{-\ 26} \end{array}$$

2.

$8 - 2 - 1 =$

$6 - 3 - 1 =$

$12 - 2 - 9 =$

$25 - 5 - 4 =$

$105 - 65 - 36 =$

3.

$$\begin{array}{rrrrr} 185 & 895 & 1,548 & 5,343 & 3,232 \\ \underline{-147} & \underline{-406} & \underline{-\ \ 997} & \underline{-4,784} & \underline{-\ \ 233} \end{array}$$

### B. Subtraction of decimals

1.

$$\begin{array}{rrrrr} .9 & .23 & .34 & .68 & .196 \\ \underline{-.6} & \underline{-.11} & \underline{-.14} & \underline{-.60} & \underline{-.099} \end{array}$$

2.

$$\begin{array}{rrrr} 1.5 & 1.5 & .019 & 15.1 \\ \underline{-1.4} & \underline{-\ .8} & \underline{-.008} & \underline{-\ 6.15} \end{array}$$

3.

$$\begin{array}{rrrr} 10 & 12 & 81.625 & 16.875 \\ \underline{-\ 5.125} & \underline{-\ 1.25} & \underline{-79\quad\ \ } & \underline{-\ 3.001} \end{array}$$

## UNIT VIII

## SHOP MATH

### ASSIGNMENT SHEET 3--MULTIPLYING NUMBERS

Directions: The following problems deal with the multiplication of numbers. Complete each of the problems and turn in the sheet to your instructor.

A. Multiplication of whole numbers

EXAMPLES: $\begin{array}{r} 4 \\ \underline{\text{x } 6} \\ 24 \end{array}$ $\qquad$ $\begin{array}{r} 24 \\ \underline{\text{x } 4} \\ 96 \end{array}$

1. $\begin{array}{r} 8 \\ \underline{\text{x } 4} \end{array}$ $\qquad$ $\begin{array}{r} 9 \\ \underline{\text{x } 3} \end{array}$ $\qquad$ $\begin{array}{r} 12 \\ \underline{\text{x } 10} \end{array}$ $\qquad$ $\begin{array}{r} 21 \\ \underline{\text{x } 14} \end{array}$ $\qquad$ $\begin{array}{r} 48 \\ \underline{\text{x } 18} \end{array}$

2. 6 x 8 =

   7 x 9 =

   4 x 12 =

   8 x 12 =

   15 x 4 =

3. $\begin{array}{r} 150 \\ \underline{\text{x } 2} \end{array}$ $\qquad$ $\begin{array}{r} 4 \\ \underline{\text{x } 150} \end{array}$ $\qquad$ $\begin{array}{r} 285 \\ \underline{\text{x } 500} \end{array}$ $\qquad$ $\begin{array}{r} 45 \\ \underline{\text{x } 125} \end{array}$

B. Multiplication of decimals

1. $\begin{array}{r} .5 \\ \underline{\text{x } .1} \end{array}$ $\qquad$ $\begin{array}{r} .6 \\ \underline{\text{x } .5} \end{array}$ $\qquad$ $\begin{array}{r} .4 \\ \underline{\text{x } .12} \end{array}$ $\qquad$ $\begin{array}{r} 4.5 \\ \underline{\text{x } 2.3} \end{array}$ $\qquad$ $\begin{array}{r} 50 \\ \underline{\text{x } 1.023} \end{array}$

2. $\begin{array}{r} 5 \\ \underline{\text{x } .125} \end{array}$ $\qquad$ $\begin{array}{r} .062 \\ \underline{\text{x } 6.875} \end{array}$ $\qquad$ $\begin{array}{r} 562 \\ \underline{\text{x } .001} \end{array}$ $\qquad$ $\begin{array}{r} 300 \\ \underline{\text{x } 5.05} \end{array}$

## UNIT VIII

## SHOP MATH

### ASSIGNMENT SHEET 4--DIVIDING NUMBERS

Directions: The following problems deal with the division of numbers. Complete each of the problems and turn in the sheet to your instructor.

A. Division of whole numbers

1. 2) 8 4) 16 5) 15 8) 48 12) 96

2. 14) 112 10) 250 15) 300 80) 1600

3. Show the remainders for the following as a fraction:

16) 641 11) 383 12) 476 67) 1,584

4. Show the remainders for the following as a two place decimal:

34) 53 68) 1,489 174) 452

B. Division of decimals

(NOTE: Carry the answer for two decimal places.)

1. .3) .5 .25) 1.50 1.5) 3.45 1.6) .346

2. 6) 5.5 148) 125.4 1.125) 6.75

## UNIT VIII

## SHOP MATH

### INFORMATION SHEET 2--FRACTIONS

I. Addition and subtraction of fractions

A. Fractions with the same denominators can be added or subtracted by totaling or subtracting the numerators.

EXAMPLE: $\frac{1}{4} + \frac{2}{4} = \frac{3}{4}$ $\quad$ $\frac{5}{16} - \frac{3}{16} = \frac{2}{16}$

B. Fractions with different denominators must be changed to fractions of equal value with a common denominator before adding or subtracting.

EXAMPLE: $\frac{1}{2} + \frac{1}{4} =$

1. Divide the larger denominator by the smaller denominator.

Example: $\frac{1}{2} + \frac{1}{4} =$

$$\begin{array}{r} 2. \\ 2\overline{)4} \\ \underline{4} \end{array}$$

(NOTE: If the denominators will not divide evenly, then multiply each fraction by the other fraction's denominator.)

2. Multiply the numerator of the fraction by the resulting number.

EXAMPLE: $2 \times \frac{1}{2} = \frac{2}{4}$

$\frac{2}{4} + \frac{1}{4} =$

3. Then add the fractions as you would those with the same denominator.

EXAMPLE: $\frac{2}{4} + \frac{1}{4} = \frac{3}{4}$

C. To reduce a fraction to the lowest form, divide the denominator and numerator by the same number.

EXAMPLE: $\frac{4}{8}$ can be divided by 4 $\quad$ $\frac{4}{8} \frac{\div}{\div} \frac{4}{4} = \frac{1}{2}$

D. When fractions and whole numbers are both used in a problem, the numbers should be changed to an improper fraction and a common denominator found.

1. Multiply the whole number by the denominator of the fraction,and add the result to the numerator.

   EXAMPLE: $1\frac{1}{2} + 3\frac{3}{4} =$

   $$\frac{2+1}{2} + \frac{12+3}{4} =$$

   $$\frac{3}{2} + \frac{15}{4} =$$

2. Find a common denominator for the improper fractions.

   EXAMPLE: $\frac{3}{2} + \frac{15}{4} =$

   $$\frac{6}{4} + \frac{15}{4} = \frac{21}{4}$$

3. Reduce the improper fraction to the smallest form by dividing the numerator by the denominator.

   EXAMPLE: $\frac{21}{4} = \begin{array}{r} 5 \\ 4\overline{)\,21} \\ \underline{20} \\ 1 \end{array}$

   $$\frac{21}{4} = 5\frac{1}{4}$$

4. Subtraction of whole numbers and fractions can also be done by changing the numbers to improper fractions.

   EXAMPLE 1: $5\frac{1}{4} - 3\frac{3}{4} =$

   $$\frac{21}{4} - \frac{15}{4} = \frac{6}{4} = 1\frac{2}{4} = 1\frac{1}{2}$$

   EXAMPLE 2: $5\frac{1}{4} - 3\frac{3}{4} =$

   $$4\frac{5}{4} - 3\frac{3}{4} = 1\frac{2}{4} = 1\frac{1}{2}$$

   (NOTE: If denominators are different, a common denominator must be found.)

## II. Multiplication of fractions

### A. Common fractions

1. Multiply numerators by numerators and denominators by denominators.

   EXAMPLE: $\frac{3}{4} \times \frac{4}{5} = \frac{12}{20}$

2. Reduce the product to the simple form.

   EXAMPLE: $\frac{12}{20} = \frac{3}{5}$

### B. Whole numbers by fractions.

1. Multiply the whole number by the numerator.

   EXAMPLE: $3 \overset{\curvearrowleft}{\times} \frac{3}{4} = \frac{9}{4}$

2. Divide the product by the denominator.

   EXAMPLE: $\frac{9}{4} =$

$$\begin{array}{rl} & 2 \\ 4) & \overline{\,9\,} \\ & \underline{8} \\ & 1 \end{array} = 2\,\frac{1}{4}$$

### C. Whole numbers by mixed number (whole number and fraction).

1. Multiply by the fraction first.

   EXAMPLE: $12 \times 4\,\frac{1}{2} =$

$$12 \times \frac{1}{2} = \frac{12}{2} = 6$$

2. Then multiply by the whole number.

   EXAMPLE: $12 \times 4 = 48$

3. Add the result of each

   EXAMPLE: $48 + 6 = 54$

D. Mixed numbers (whole number and fraction) by a whole number.

1. Multiply the fraction first.

EXAMPLE: $4\frac{1}{2} \times 12 =$

$$\frac{1}{2} \times 12 = \frac{12}{2} = 6$$

2. Then multiply the whole number

EXAMPLE: $4 \times 12 = 48$

3. Add the result of each.

EXAMPLE: $6 + 48 = 54$

E. Mixed numbers by mixed numbers.

1. Convert each mixed number to an improper fraction.

EXAMPLE: $1\frac{5}{8} \times 4\frac{3}{4} =$

$$\frac{13}{8} \times \frac{19}{4} =$$

2. Multiply numerators by numerators and denominators by denominators.

EXAMPLE: $\frac{13}{8} \times \frac{19}{4} = \frac{247}{32}$

3. Reduce the results to the simplest form.

EXAMPLE: $\frac{247}{32} =$

$$\begin{array}{r} 7 \\ 32\overline{)\,247} \\ 224 \\ \hline 23 \end{array} = 7\frac{23}{32}$$

III. Division of fractions

A. Common fractions

1. Invert the divisor.

EXAMPLE: $\frac{1}{2} \div \frac{2}{3} =$

$$\frac{3}{2}$$

2. Multiply the inverted number by the other fraction.

EXAMPLE: $\frac{1}{2} \times \frac{3}{2} = \frac{3}{4}$

(NOTE: Reduce the answer if it is an improper fraction.)

B. Mixed numbers

1. Change both mixed numbers to improper fractions.

EXAMPLE: $3\frac{3}{4} \div 2\frac{1}{4} =$

$\frac{15}{4} \div \frac{9}{4} =$

2. Invert the divisor and multiply.

EXAMPLE: $\frac{15}{4} \div \frac{9}{4} = \frac{60}{36}$

3. Reduce the answer to the simplest form.

EXAMPLE: $\frac{60}{36}$

$$\begin{array}{r} 1 \\ 36\overline{)\,60} \\ \underline{36} \\ 24 \end{array} = 1\frac{24}{36} = 1\frac{2}{3}$$

## UNIT VIII

## SHOP MATH

### ASSIGNMENT SHEET 5--SOLVING PROBLEMS WITH FRACTIONS

Directions: Complete the following problems dealing with fractions.

A. Add the following:

1. $\frac{1}{4} + \frac{3}{4} =$

2. $\frac{3}{4} + \frac{3}{8} =$

3. $\frac{1}{2} + \frac{1}{4} + \frac{5}{8} =$

4. $1\frac{1}{2} + 3\frac{5}{8} + 1\frac{1}{3} =$

5. $\frac{8}{5} + 1\frac{1}{2} + 6\frac{4}{5} =$

B. Subtract the following:

1. $\frac{4}{5} - \frac{1}{5} =$

2. $\frac{3}{4} - \frac{3}{8} =$

3. $1\frac{3}{8} - \frac{7}{8} =$

4. $4\frac{5}{16} - 3\frac{3}{4} =$

5. $6\frac{7}{8} - 4\frac{15}{16} =$

C. Multiply the following:

1. $\frac{1}{2} \times \frac{3}{4} =$

2. $1\frac{1}{4} \times \frac{1}{2} =$

3. $3\frac{1}{2} \times 4\frac{3}{4} =$

4. $\frac{4}{5} \times 1\frac{3}{8} =$

5. $4\frac{3}{8} \times 1\frac{5}{6} =$

D. Divide the following

1. $\frac{7}{8} \div \frac{1}{8} =$

2. $3\frac{3}{4} \div \frac{1}{4} =$

3. $4 \div \frac{5}{16} =$

4. $3\frac{3}{4} \div 1\frac{1}{2} =$

5. $\frac{3}{4} \div 4 =$

# UNIT VIII

# SHOP MATH

## INFORMATION SHEET 3--METRIC MEASUREMENT

I. Base metric measurements

A. Meter--The base measurement for length in the metric system.

(NOTE: The U.S. equal of this distance is 39.37 inches, or 3 3/8 inches longer than a yard.)

B. Gram--The base measurement for weight in the metric system.

C. Liter--The base measurement for volume in the metric system.

II. Prefixes (multiples or divisions) of base measurement

A. For less than one (meter, gram, liter)

1. Milli (m)--$\frac{1}{1000}$ or x .001

2. Centi (c)--$\frac{1}{100}$ or x .01

3. Deci (d)--$\frac{1}{10}$ or x .1

B. For more than one (meter, gram, liter)

1. Deka (da)-- x 10

2. Hecto (h)-- x 100

3. Kilo (k)-- x 1000

III. Multiples and divisions of the meter

| Multiples | | | Unit | Subdivision | | |
|---|---|---|---|---|---|---|
| Kilometer | | | | | | |
| 10 hm | Hectometer | | | | | |
| 100 da m | 10 da m | Dekometer | | | | |
| 1000 m | 100 m | 10 m | Meter | | | |
| | | | 10 d m | Decimeter | | |
| | | | 100 c m | 10 c m | Centimeter | |
| | | | 1000 m m | 100 m m | 10 mm | Millimeter |

## IV. U.S. to metric conversion

A. Meter--To convert a U.S. measurement of length to metric, multiply the length by the metric equivalent shown in the chart below.

| METRIC EQUIVALENT | | | | |
|---|---|---|---|---|
| | MILLIMETER | CENTIMETER | METER | KILOMETER |
| INCH | 25.4 | 2.54 | .0254 | |
| FOOT | 304.8 | 30.48 | .3048 | |
| YARD | 914.4 | 91.44 | .9144 | |
| MILE | | | 1,609.3 | 1.609 |

EXAMPLE: 1 inch = 2.54 centimeters = 25.4 millimeters
so to find the equivalent of 5 inches

5 inches x 2.54 centimeters = 12.70 centimeters

and to find the equivalent of 3/4 inch

3/4 = .75 inch

.75 inch x 2.54 centimeters = 1.905 centimeters

and to find the equivalent of 2 1/2 inches

2 1/2 = 2.5 inches

2.5 inches x 2.54 centimeters = 6.35 centimeters

(NOTE: Other equivalents of the above U.S. Measurements could be figured by using the other metric equivalents rather than the 2.54 centimeters.)

B. Grams--To convert a U.S. measurement of weight to metric, multiply the weight by the metric equivalent shown below.

| METRIC EQUIVALENT | | |
|---|---|---|
| | GRAM | KILOGRAM |
| OUNCE | 25.35 | |
| POUND | 453.6 | .4536 |

EXAMPLES: 1 ounce = 28.36 grams and
1 pound = 453.6 grams
so to find the equivalent of 5 pounds

5 pounds x 453.6 grams = 2,268 grams

and to find the equivalent of 100 pounds

100 pounds x 453.6 grams = 45,360 grams

and to find the equivalent of 1,000 pounds

1,000 pounds x 453.6 grams = 453,360 grams

(NOTE: To find the equivalent in the kilograms, use the equivalent .4536.)

C. Liters--To convert U.S. measurement of volume to metric, multiply the volume by the metric equivalent shown below.

| METRIC EQUIVALENT | | | |
|---|---|---|---|
| | LITER | DECILITER | CENTILITER |
| PINT | .473 | 4.73 | 47.32 |
| QUART | .946 | 9.46 | 94.6 |
| GALLON | 3.785 | 37.85 | 378.5 |

EXAMPLES: 1 gallon = 3.785 liters
so to find the equivalent of 4 gallons

4 gallons x 3.785 liters = 15.4 liters

and to find the equivalent of 2 pints
1 pint = .473 liter

2 pints x .473 liter = .946 liter

(NOTE: Other equivalents of the above U.S. measurements could be figured by using other equivalents.)

# EQUIVALENTS CONVERSION CHARTS

## Metric-English Equivalents

### Approximate Values

1 mm = 0.04 inch
1 cm = 0.4 inch
1 m = 39.37 inches
1 km = 0.6 mile
1 cm$^2$ = 0.16 square inch
1 m$^2$ = 10.8 square feet
1 m$^2$ = 1.2 square yards
1 hectare = 2.5 acres
1 cm$^3$ = 0.06 cubic inch
1 m$^3$ = 35.3 cubic feet
1 m$^3$ = 1.3 cubic yards
1 ml = 0.034 ounce
1 cl = 0.34 ounce
1 l = 2.1 pints
1 l = 1.06 quarts
1 l = 0.26 gallon
1 g = 0.035 ounce
1 kg = 2.2 pounds
1 metric t = 1.1 U.S. ton

## English-Metric Equivalents

### Approximate Values

1 inch = 25.4 mm
1 inch = 2.54 cm
1 foot = 0.305 m
1 yard = 0.91 m
1 mile = 1.61 km
1 square inch = 6.5 cm$^2$
1 square foot = 0.09 m$^2$
1 square yard = 0.8 m$^2$
1 acre = 0.4 hectare
1 cubic inch = 16.4 cm$^3$
1 cubic foot = 0.03 m$^3$
1 cubic yard = 0.8 m$^3$
1 pint = 0.47 l
1 quart = 0.95 l
1 gallon = 3.79 l
1 ounce = 28.35 g
1 pound = 0.45 kg
1 U.S. ton = 0.9 metric ton

## UNIT VIII

## SHOP MATH

### ASSIGNMENT SHEET 6--METRIC MEASURES

Directions: Answer each of the following questions in the blanks provided.

A. 1. one meter = ____________ millimeters

2. one meter = ____________ centimeters

3. one meter = ____________ decimeters

4. one dekameter = ________ meters

5. one hectometer = _______ meters

6. one kilometer = ________ meters

B. Under the metric system, length is measured in ________________.

C. Under the metric system,weight is measured in _________________.

D. Under the metric system,volume is measured in _________________.

E. One meter is equal to ________________________ inches.

F. One kilogram is equal to _____________________ pounds.

G. One liter is equal to ________________________ quarts.

H. Estimate the (1) width, (2) length, and (3) height of this room in meters.

1. _____________________

2. _____________________

3. _____________________

I. Estimate your height in centimeters. _____________________

J. Estimate your weight in kilograms. _______________________

## UNIT VIII

## SHOP MATH

### ASSIGNMENT SHEET 7--CHANGING U.S. MEASUREMENT TO METRIC

Directions: Using the charts in the information sheet, change each of the following U.S. measurements to metric.

A. Change the following to millimeters:

(NOTE: 1 inch = 25.4 millimeters)

1. 2 1/2 inches = ________________
2. 4 inches = ________________
3. .050 inch = ________________
4. 1.5 inches = ________________
5. 3/4 inch = ________________

B. Change the following to centimeters:

(NOTE: 1 inch = 2.54 centimeters)

1. 6 inches = ________________
2. 14 inches = ________________
3. 27 inches = ________________
4. 39.37 inches = ________________
5. 1/2 inch = ________________

C. Change the following feet to centimeters:

(Note: 1 foot = 30.48 centimeters)

1. 3 feet = ________________
2. 10 1/2 feet = ________________
3. 5 feet = ________________
4. 7.75 feet = ________________
5. 1 1/4 feet = ________________

D. Change the following feet to meters:

(NOTE: 1 foot = .3048 meter.)

1. 3 1/2 feet = ____________________

2. 16 feet = ____________________

3. 5,280 feet = ____________________

4. 900 feet = ____________________

5. 2 1/4 feet = ____________________

E. Change the following miles to kilometers:

(NOTE: 1 mile = 1.609 kilometers)

1. 1/2 mile = ____________________

2. 5 miles = ____________________

3. 60 miles = ____________________

4. 10 miles = ____________________

5. 4 1/4 miles = ____________________

## UNIT VIII

## SHOP MATH

### ASSIGNMENT SHEET 8--SELECTING METRIC MEASUREMENTS

Directions: Read the following explanation of how to select which metric measurement to use for length when measuring. Then write the measurement (meter, kilometer, centimeter, millimeter) that you would use to show the length for the following items.

1. The meter is used in place of the foot and yard when showing dimensions of larger objects and short distances.
2. The kilometer is used in place of the mile when measuring long distances.
3. The centimeter is used in place of feet and inches when measuring items such as sheet metal and short bars of steel.
4. The millimeter is used in place of the inch when measuring small dimensions or short lengths. It is used in precision measurement.

### ITEMS

_____________________ A. The length of a swimming pool.

_____________________ B. The length of a hammer handle.

_____________________ C. The distance to another city.

_____________________ D. The thickness of sheet metal.

_____________________ E. The width of the room.

_____________________ F. The length of a trailer.

_____________________ G. The diameter of a small shaft.

_____________________ H. The size of a drill bit.

_____________________ I. The width of a trailer.

_____________________ J. The length of a long pipe.

## UNIT VIII

## SHOP MATH

### INFORMATION SHEET 4--ANGLES AND CIRCLES

I. Parts of a circle

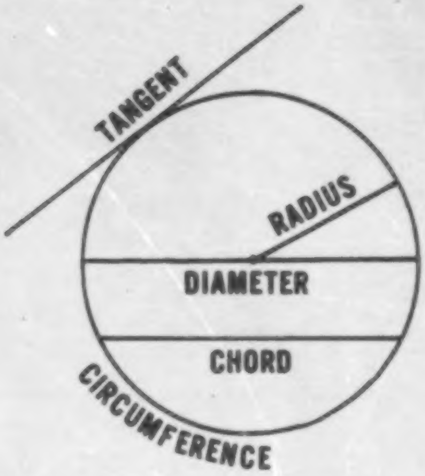
A. Circumference--The length of the curved line that forms a circle.

B. Diameter--A straight line drawn through the center of a circle.

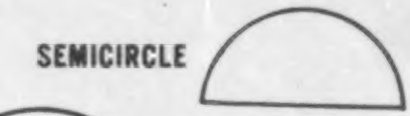
C. Radius--One-half of the diameter.

D. Tangent--A line that touches an arc or the circumference.

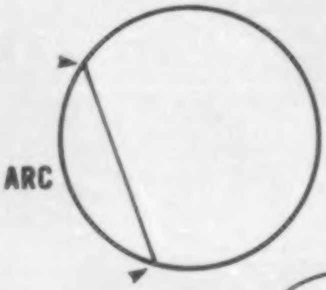
E. Chord--A straight line connecting the two points on the circumference of a circle or the two ends of an arc.


TANGENT
RADIUS
DIAMETER
CHORD
CIRCUMFERENCE

F. Semicircle--A half-circle.


SEMICIRCLE

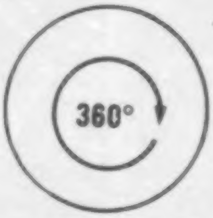
G. Arc--Any part of the circumference of a circle between two points.



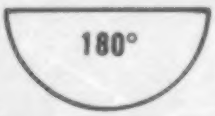
II. Angles

A. A circle has 360 degrees.

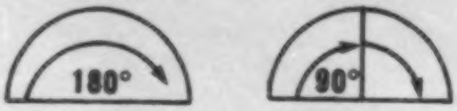
(NOTE: A degree is $\frac{1}{360}$ of a circle.)



B. A half-circle would contain 180°. (semicircle)

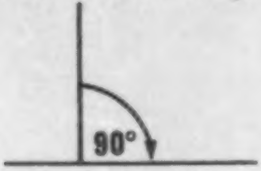


C. One-half of a semicircle contains 90°.



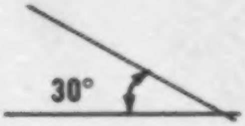
(NOTE: A 90° angle is called a right angle.)

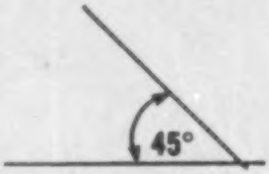
D. Two lines that meet to form a right angle are perpendicular.

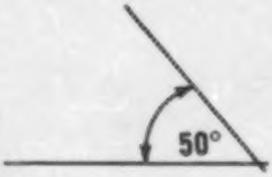


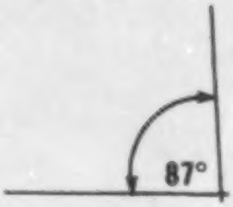
E. When two lines meet to form any angle less than 90°, the angle is called an acute angle.

EXAMPLES:



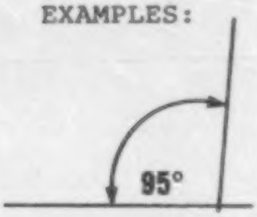


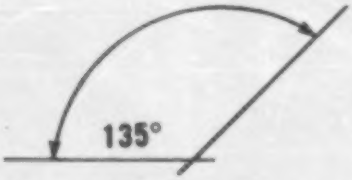


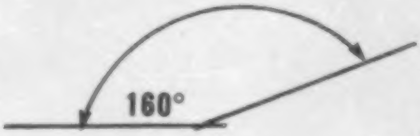


F. When two lines meet to form any angle more than 90°, the angle is called an obtuse angle.

EXAMPLES:

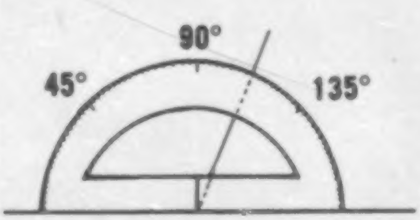






G. Measuring an angle with a protractor.

1. Use one line of the angle for the base.

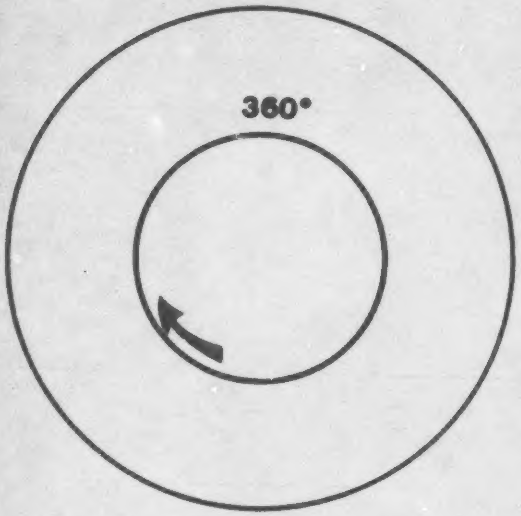


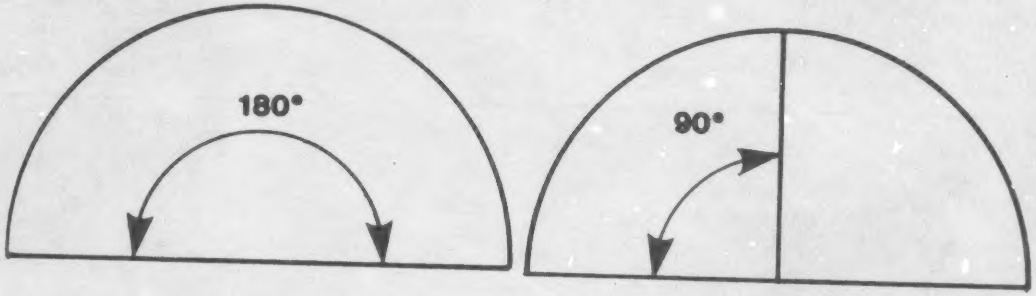
2. The point where the lines meet should be placed in the center of the protractor.

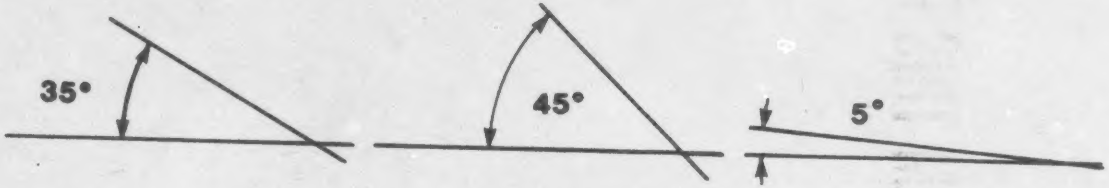
3. Locate the point where the line crosses the scale on the curve of the protractor.

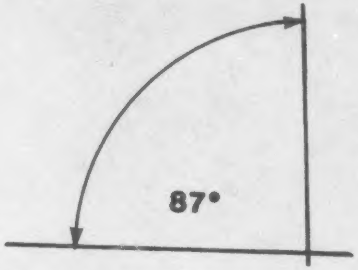
4. Read the number of degrees from 0° point on the side of of the base line to the point where the line crosses the curve of the protractor.

H. Divisions of degrees
1. Minutes (60 minutes = 1 degree)
2. Seconds (60 seconds = 1 minute)

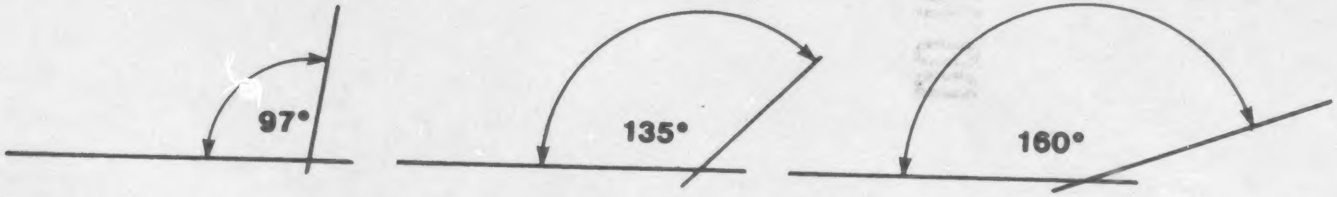






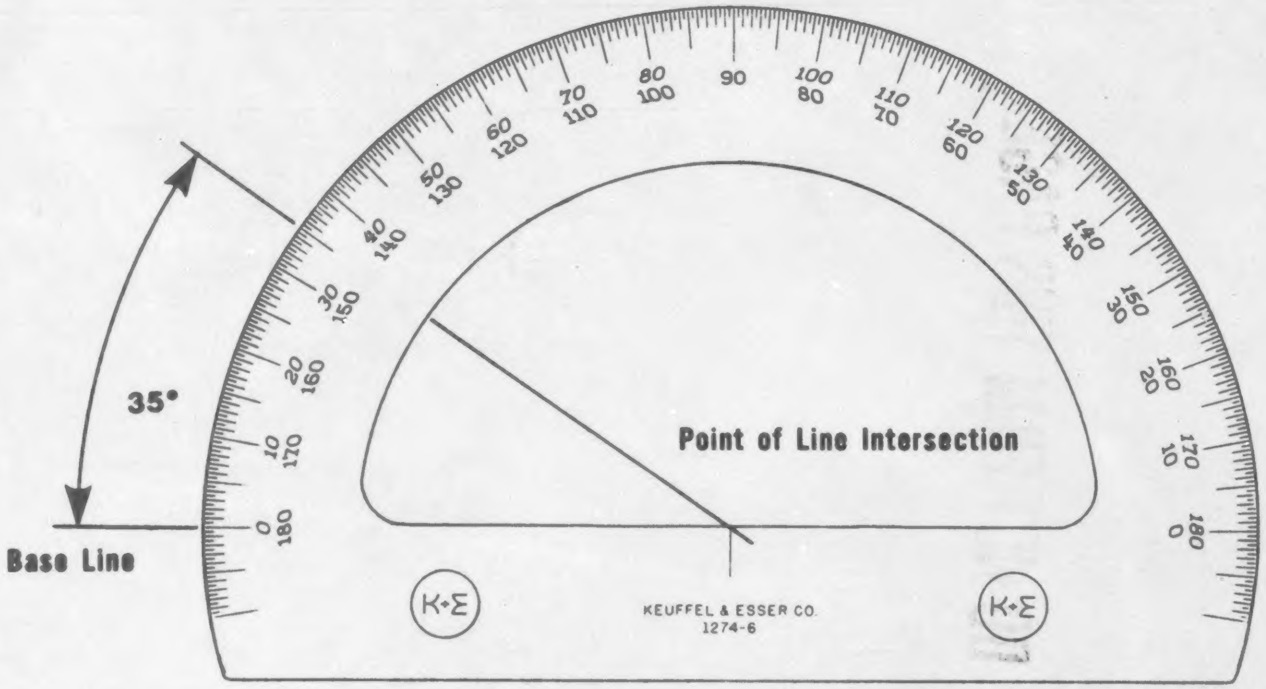


## Acute Angles

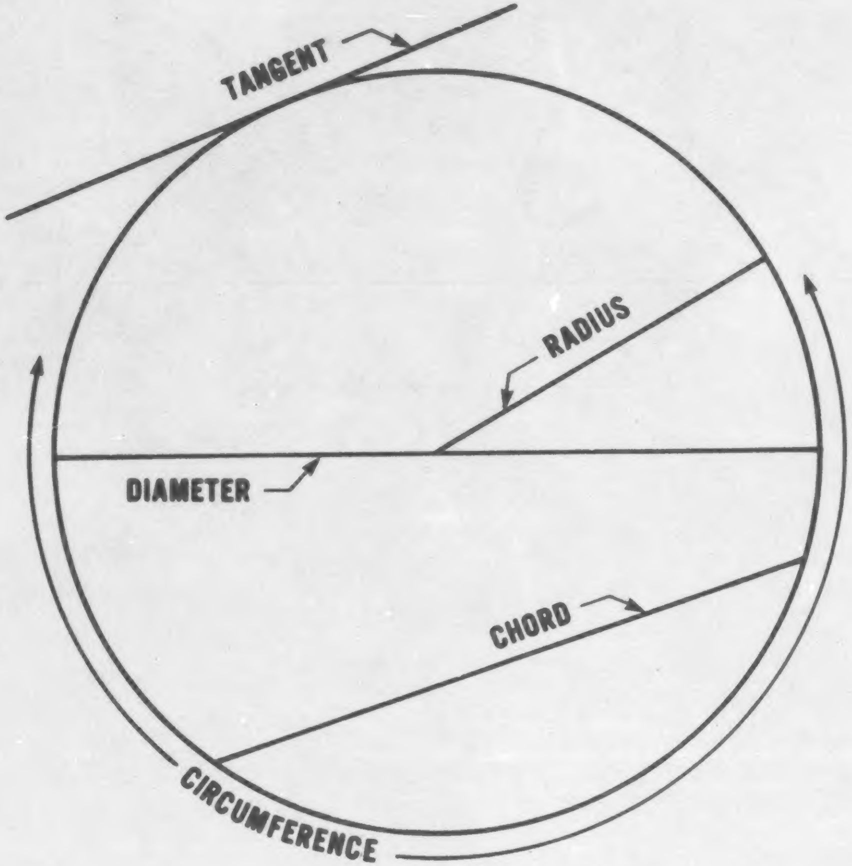


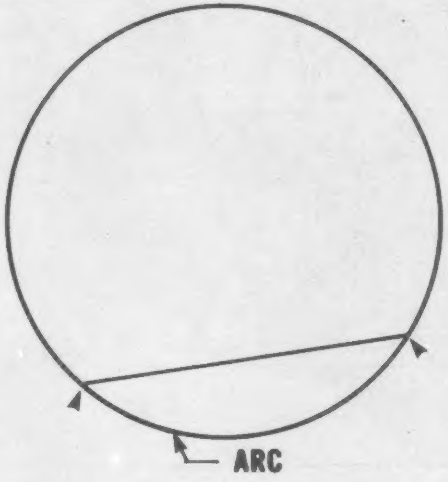
## Obtuse Angles

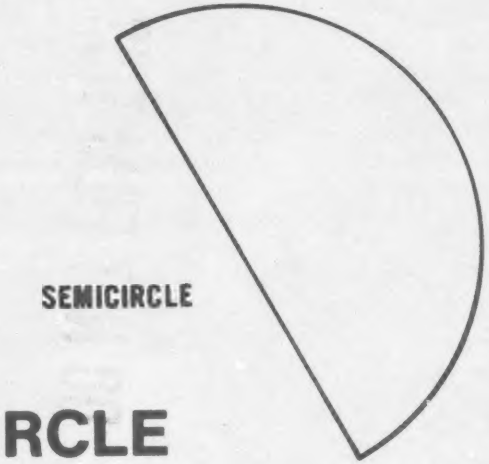
# MEASURING WITH A PROTRACTOR


35°
Base Line
Point of Line Intersection
K+E
KEUFFEL & ESSER CO.
1274-6
K+E

# PARTS OF A CIRCLE


TANGENT
RADIUS
DIAMETER
CHORD
CIRCUMFERENCE




SEMICIRCLE

## UNIT VIII

## SHOP MATH

### ASSIGNMENT SHEET 9--CIRCLES

Directions: Answer each of the following questions relating to the use of circles. Use the words below to complete statements.

Semicircle

Chord

Radius

Diameter

Tangent

Circumference

A. Use a compass and a ruler to draw a circle with a diameter of 1-1/2 inches at the right.

B. What is the length of the radius of the circle? ________________.

C. Draw a line that is tangent to the circle.

D. Draw a line that is one inch long and a chord of the circle above.

E. A line through the center of a circle and touching both sides of the circle is called the ________________________________.

F. A line from the center of the circle to one side is called the ____________________________.

G. The distance around the outside edge of the circle is called the ____________________________.

H. A line that touches two sides of a circle but does not go through the center is called a ________________________.

I. One-half of a circle is called a ______________________________.

# UNIT VIII

# SHOP MATH

## ASSIGNMENT SHEET 10--ANGLES

Directions: You will need a protractor to complete the following questions. Use the answer list below to complete the questions.

perpendicular
obtuse
acute
20°
50°
90°
360°
180°
145°

A. Draw the following angles with your protractor.

1. 90°
2. 30°
3. 45°
4. 135°
5. 180°
6. 19°

B. When two lines intersect to form a right angle, they are ____________________ to each other.

C. An angle of less than 90° is called an ____________________.

D. An angle of more than 90° is called an ____________________.

E. A right angle contains ____________________ degrees.

F. A circle contains ____________________ degrees.

G. A semicircle contains ____________________ degrees.

# UNIT VIII

# SHOP MATH

## ANSWERS TO ASSIGNMENTS

### ASSIGNMENT 1

A. 1. 8, 12, 24, 31, 100.
   2. 12, 25, 36, 63, 172.
   3. 220, 274, 2,007, 14,731, 9,860.

B. 1. .8, .22, 1.01, .821, 1.125.
   2. 9.1, 75.35, 34.4, 31.15.
   3. 22.7, 27.04, 7.505.

### ASSIGNMENT 2

A. 1. 2, 6, 12, 73, 74.
   2. 5, 2, 1, 16, 4.
   3. 38, 489, 551, 559, 2,999.

B. 1. .3, .12, .2, .08, .097.
   2. .1, .7, .011, 8.85.
   3. 4.875, 11.75, 2.625, 13,874

### ASSIGNMENT 3

A. 1. 24, 27, 120, 294, 770.
   2. 48, 63, 48, 96, 60.
   3. 300, 600, 142,500, 5,625.

B. 1. .05, .30, .048, 10.35, 51.150.
   2. .625, .42625, .562, 1,515.

### ASSIGNMENT 4

A. 1. 4, 4, 3, 6, 8.
   2. 8, 25, 20, 20.
   3. 40-1/16, 34-9/11, 29-2/3, 23-43/67.

4. 1.55, 21.89, 2.59.

B. 1. 1.66, 6, 2.3, .21.

2. .91, .84, 6.

ASSIGNMENT 5

A. 1. 1

2. 1-1/8

3. 1-3/8

4. 6-11/24

5. 9-9/10

B. 1. 3/5

2. 3/8

3. 1/2

4. 9/16

5. 1-15/16

C. 1. 3/8

2. 5/8

3. 24-1/8

4. 2-1/10

5. 8-1/48

D. 1. 7

2. 15

3. 1-1/4

4. 2-1/2

5. 3/16

ASSIGNMENT 6

A. 1. 1000

2. 100

3. 10
4. 10
5. 100
6. 1000

B. meters

C. grams

D. liters

E. 39.37

F. 2.204

G. 1.056

H-J. Evaluated to the satisfaction of the instructor.

ASSIGNMENT 7

A. 1. 63.5
   2. 101.6
   3. 1.27
   4. 38.1
   5. 19.05

B. 1. 15.24
   2. 35.56
   3. 68.56
   4. 99.99
   5. 1.27

C. 1. 91.44
   2. 320.08
   3. 152.40
   4. 256.33
   5. 38.1

D. 1. 1.066
   2. 4.876
   3. 1600.244
   4. 274.32
   5. .685

E. 1. .804
   2. 8.045
   3. 965.4
   4. 16.09
   5. 6.838

ASSIGNMENT 8

A. 1
B. 3
C. 2
D. 4
E. 1
F. 1
G. 4
H. 4
I. 3
J. 3

ASSIGNMENT 9

A. Drawing of circle with 1-1/2 inch diameter.
B. 3/4 inch
C. A line tangent to drawing of circle in A.
D. A 1-inch chord in the circle in A.
E. Diameter
F. Radius
G. Circumference
H. Chord
I. Semicircle

ASSIGNMENT 10

A. Evaluated to the satisfaction of the instructor.

B. perpendicular

C. acute

D. obtuse

E. 90°

F. 360°

G. 180°

# UNIT VIII

# SHOP MATH

## TEST--PART 1

1. Match the basic math terms to the correct definition by writing the number of each term in the correct blank on the left.

_____ a. Any natural number that is not broken into parts.

_____ b. A part of a whole number or one.

_____ c. The distance or size from one point to another point.

_____ d. The mark on a measuring tool indicating size or degrees.

_____ e. A semi-precision measuring instrument graduated in fractional or decimal parts of an inch.

_____ f. To find the amount, size, or length of something.

_____ g. A mistake in figuring total measurement.

_____ h. A proper fraction with the bottom number being 10, 100, or 1000.

1. Rule
2. Error
3. Fraction
4. Whole number
5. Decimal
6. Measure
7. Dimension
8. Graduation

2. Identify the three standard lengths of measurement by writing the correct term in the space provided.

inch foot yard

__________ a. A length of measurement containing twelve inches.

__________ b. A length of measurement containing 36 inches or or 3 feet.

__________ c. The smallest whole unit of measurement commonly used.

3. Select the proper terms used in working math problems by circling the number of the word that best identifies each statement.

a. Putting two or more numbers together to find a total is:

(1) subtraction

(2) multiplication

(3) addition

b. A fraction with a larger numerator than denominator is a:

(1) subtrahend

(2) improper fraction

(3) multiplier

c. To find out how many of one number there are in another number is:

(1) division

(2) addition

(3) subtraction

d. The answer when adding two or more numbers is the

(1) sum

(2) difference

(3) product

e. A part of a whole number or one is a:

(1) quotient

(2) fraction

(3) denominator

f. The taking of one number from another to obtain a remainder is:

(1) division

(2) multiplication

(3) subtraction

g. The top number of a fraction is a:

(1) denominator

(2) numerator

(3) divisor

h. Adding a number to itself a certain number of times is:

(1) minuend

(2) multiplication

(3) product

## UNIT VIII

## SHOP MATH

### TEST--PART 2

1. Add or subtract the following fractions:

   a. $\frac{3}{4} + \frac{1}{4} =$

   b. $\frac{1}{2} + \frac{1}{4} =$

   c. $1\frac{1}{3} + 2\frac{1}{2} =$

   d. $3\frac{15}{16} + 8\frac{1}{4} =$

   e. $1\frac{4}{5} + 15\frac{3}{4} =$

   f. $5\frac{3}{4} - 2\frac{1}{4} =$

   g. $6\frac{1}{8} - 3\frac{3}{8} =$

   h. $4\frac{1}{3} - 1\frac{4}{5} =$

   i. $15\frac{1}{8} - 4\frac{3}{16} =$

   j. $69\frac{3}{32} - 48\frac{7}{16} =$

2. Multiply the following fractions.

   a. $\frac{1}{5} \times \frac{1}{5} =$

   b. $\frac{3}{4} \times \frac{1}{4} =$

   c. $3 \times \frac{4}{5} =$

   d. $3\frac{3}{4} \times 5 =$

e. $16 \times 3\frac{1}{8} =$

f. $1\frac{1}{4} \times 3\frac{4}{5} =$

g. $10\frac{5}{8} \times 3\frac{1}{8} =$

h. $5\frac{1}{7} \times 3\frac{2}{5} =$

i. $15 \times \frac{1}{64} =$

j. $1\frac{1}{2} \times 10\frac{1}{8} =$

3. Divide the following fractions:

a. $\frac{5}{8} \div \frac{1}{4} =$

b. $1\frac{4}{5} \div \frac{1}{2} =$

c. $5 \div \frac{3}{16} =$

d. $\frac{1}{4} \div 6 =$

e. $4\frac{1}{2} \div 5\frac{1}{8} =$

## UNIT VIII

## SHOP MATH

### TEST--PART 3

1. Identify the three base metric measurements by writing the number of each answer in the correct blank on the left.

_____ a. The base measurement for length. 1. gram

_____ b. The base measurement for weight. 2. liter

_____ c. The base measurement for volume. 3. meter

2. Point out the correct metric prefix for multiples or divisions of base measurement by writing the number of the correct answer in the space provided.

_______ a. $\frac{1}{1000}$ or x .001 1. Deka

_______ b. $\frac{1}{100}$ or x .01 2. Deci

_______ c. $\frac{1}{10}$ or x .1 3. Hecto

_______ d. x 10 4. Kilo

_______ e. x 100 5. Centi

_______ f. x 1000 6. Milli

3. Select the correct division or multiple of the meter by circling the correct answers below.

a. A kilometer contains (100, 200, 50) dekometers.

b. A meter contains (10, 100, 500) decimeters.

c. A kilometer contains (10, 20, 100) hectometers.

d. A meter contains (100, 15, 20) centimeters.

e. A centimeter contains (100, 5, 10) millimeters.

f. A kilometer contains (10, 50, 100) meters.

g. A meter contains (10, 100, 1000) millimeters.

4. Convert the following U.S. measurements into metric. Use the conversion charts for each set of problems.

(NOTE: Always multiply the metric equivalent by the U.S. measure.)

| | Millimeter | Centimeter | Meter |
|---|---|---|---|
| INCH | 25.4 | 2.5 | .0254 |
| FOOT | 304.8 | 30.48 | .3048 |
| YARD | 914.4 | 91.44 | .9144 |

U.S. MEASUREMENT — METRIC EQUIVALENT

a. 3 inches = centimeters

b. 2.5 inches = millimeters

c. 3 feet = meters

d. 2 feet 4 inches = centimeters

e. 5 yards = millimeters

| | GRAMS | KILOGRAM |
|---|---|---|
| OUNCE | 25.35 | |
| POUND | 453.6 | .4536 |

U.S. MEASUREMENT — METRIC EQUIVALENT

f. 2 ounces = grams

g. 3.5 ounces = grams

h. 1 pound = kilograms

i. 2 pounds = grams

j. 3 pounds 5 ounces= grams

| | LITER | DECILITER | CENTILITER |
|---|---|---|---|
| PINT | .473 | 4.73 | 47.32 |
| QUART | .946 | 9.46 | 94.6 |
| GALLON | 3.78 | 37.85 | 378.5 |

U.S. MEASUREMENT    METRIC EQUIVALENT

k. 2 pints = deciliter

l. 2 pints = liters

m. 3 quarts = deciliter

n. 1 gallon = centiliter

o. 2 gallon 1 pint = liters

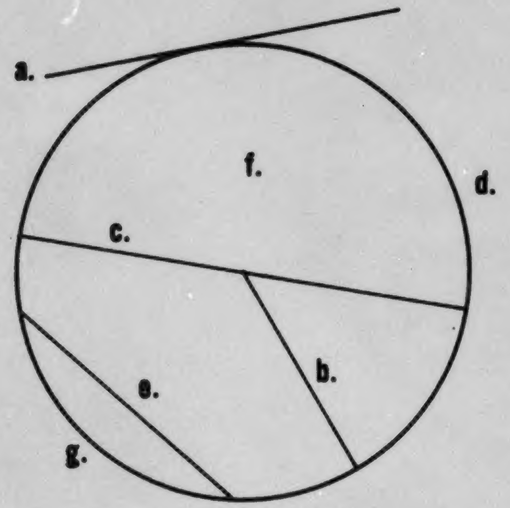
# UNIT VIII

# SHOP MATH

## TEST--PART 4

1. Identify the parts of a circle by labeling each of the lettered parts below with one of the following terms:

| | |
|---|---|
| Diameter | Tangent |
| Arc | Circumference |
| Radius | Semicircle |
| Chord | |



2. Point out the measurement of angles by circling the number in front of the answer that best completes each statement below.

   a. A circle has

      (1) 180°

      (2) 360°

      (3) 450°

   b. A half of a circle would contain

      (1) 180°

      (2) 360°

      (3) 450°

c. One-half of a semicircle contains

(1) 45°

(2) 90°

(3) 180°

d. Two lines that meet to form a right angle are

(1) parallel

(2) crooked

(3) perpendicular

e. An angle of less than 90° is called

(1) obtuse angle

(2) acute angle

(3) right angle

f. An angle of more than 90° is called a

(1) obtuse angle

(2) acute angle

(3) right angle

# UNIT VIII

# SHOP MATH

## ANSWERS TO TEST

### PART 1

1. a. 4
   b. 3
   c. 7
   d. 8
   e. 1
   f. 6
   g. 2
   h. 5

2. a. foot
   b. yard
   c. inch

3. a. 3
   b. 2
   c. 1
   d. 1
   e. 2
   f. 3
   g. 2
   h. 2

### PART 2

1. a. 1
   b. $\frac{3}{4}$
   c. $3\frac{5}{6}$
   d. $12\frac{3}{16}$
   e. $17\frac{11}{20}$
   f. $3\frac{1}{2}$
   g. $2\frac{3}{4}$
   h. $2\frac{8}{15}$
   i. $10\frac{15}{16}$
   j. $20\frac{21}{32}$

2. a. $\frac{1}{25}$
   b. $\frac{3}{16}$
   c. $2\frac{2}{5}$
   d. $18\frac{3}{4}$
   e. 50
   f. $4\frac{3}{4}$
   g. $33\frac{13}{64}$
   h. $12\frac{12}{35}$
   i. $\frac{15}{64}$
   j. $15\frac{3}{16}$

3. a. $2\frac{1}{2}$
   b. $3\frac{3}{5}$
   c. $26\frac{2}{3}$
   d. $\frac{1}{24}$
   e. $\frac{8}{9}$

## PART 3

1. a. 3
   b. 1
   c. 2
2. a. 6
   b. 5
   c. 2
   d. 1
   e. 3
   f. 4
3. a. 100
   b. 10
   c. 10
   d. 100
   e. 10
   f. 1000
   g. 1000
4. a. 7.5
   b. 63.5
   c. 1.2144
   d. 70.96
   e. 4,572
   f. 50.7
   g. 88.725
   h. .4536
   i. 907.2
   j. 1,373.475
   k. 9.46
   l. .946
   m. 28.38
   n. 378.5
   o. 8.033

## PART 4

1. a. Tangent
   b. Radius
   c. Diameter
   d. Circumference
   e. Chord
   f. Semicircle
   g. Arc

2. a. 2
   b. 1
   c. 2
   d. 3
   e. 2
   f. 1

# UNIT IX

# MEASURING AND LAYOUT

## UNIT OBJECTIVE

After completing this unit, the student will be able to use the correct terms when identifying parts of measuring tools. The student will use proper safety when using the measuring and layout tools. The student will also be able to measure and read measurement on each of the measuring tools. This knowledge will be evidenced through demonstration and by satisfactorily completing a unit test.

## SPECIFIC OBJECTIVE

After completion of this unit, the student will be able to:

1. Match the terms associated with measuring and layout to the correct definition.
2. Identify the semi-precision tools used in the shop.
3. Explain how to read a rule.
4. Identify the precision measuring tools used in the shop.
5. Name the parts of an outside micrometer.
6. Name the parts of the vernier caliper.
7. Name the parts of the dial indicator.
8. Name the parts of the telescoping gauge.
9. Identify the two types of parallel bars.
10. Identify the equipment used in layout.
11. Select the proper safety rules to follow during layout procedures.
12. Read a rule.
13. Measure with spring calipers.
14. Measure with a micrometer.
15. Measure with a vernier caliper.
16. Use a dial indicator.

# UNIT IX

# MEASURING AND LAYOUT

## SUGGESTED TEACHING ACTIVITIES

I. Objective Sheet

   A. Discuss the unit objective with the students.

   B. Discuss each specific objective with the students.

   C. Have the students complete the objectives in the most logical sequence for shop organization.

   D. Add any objectives necessary.

II. Information and assignment sheets

   A. INFORMATION SHEET 1--BASIC MEASUREMENT (Transparencies 1-7)

      1. Discuss the use of semi-precision tools in the shop.

      2. Explain how to read the graduations on a rule.

      3. Provide steel rules for each student.

      4. Use the following assignment sheets to reinforce this area of information:

         a. ASSIGNMENT SHEET 1--READING THE RULE

         b. ASSIGNMENT SHEET 2--MEASURING OBJECTS

         (NOTE: Provide steel rules for the students.)

         c. ASSIGNMENT SHEET 3--DRAWING LINES AND OBJECTS

         (NOTE: Provide steel rules for the students.)

         d. ASSIGNMENT SHEET 4--REDUCING MEASUREMENTS

   B. INFORMATION SHEET 2--PRECISION MEASUREMENT TOOLS (Transparencies 8-17B)

      1. Discuss the use of precision measurement tools.

      2. Demonstrate how to use each tool.

      3. Show how some tools are used together.

      Example: Telescoping gauges with micrometers.

4. Provide micrometers for each student.

5. Use the following assignment sheets to reinforce this area of information:

   a. ASSIGNMENT SHEET 5--READING THE MICROMETER

   b. ASSIGNMENT SHEET 6--READ VERNIER CALIPER SETTINGS

C. INFORMATION SHEET 3--LAYOUT

1. Discuss the use of layout tools in the shop.

2. Demonstrate the use of each tool.

3. Discuss the safety and care of the tools.

III. Transparencies

A. TM-1--TYPES OF RULES

B. TM-2--TYPES OF CALIPERS

C. TM-3--TYPES OF SQUARES

D. TM-4--GRADUATIONS ON A RULE

E. TM-5--READING WHOLE NUMBERS ON A RULE

F. TM-6--READING EIGHTHS ON A RULE

G. TM-7--READING SIXTEENTHS ON A RULE

H. TM-8--TYPES OF MICROMETERS

I. TM-9--PARTS OF A MICROMETER

J. TM-10--SLEEVE GRADUATIONS

K. TM-11--THIMBLE GRADUATIONS

L. TM-12--PARTS OF A VERNIER CALIPER

M. TM-13--VERNIER SCALE GRADUATIONS

N. TM-14--BEAM GRADUATIONS

O. TM-15--PARTS OF A DIAL INDICATOR

P. TM-16--HOLE GAUGES

Q. TM-17--OTHER MEASURING TOOLS

R. TM-17A--MEASURING TOOLS (Cont.)

S. TM-17B--MEASURING TOOLS (Cont.)

T. TM-18--LAYOUT EQUIPMENT

U. TM-18A--LAYOUT EQUIPMENT (Cont.)

IV. Answers to assignments

A. Discuss the correct answers.

B. Review problem areas pointed out on assignment sheets.

C. Some answers may vary, but class participation is as important as getting every answer correct.

V. Job sheets

A. JOB SHEET 1--READ A RULE

1. Provide rules for each student.

2. Use TMs 5-7 to explain the different graduations on the rule.

3. Show how to measure different shaped objects.

B. JOB SHEET 2--MEASURE WITH SPRING CALIPERS

1. Demonstrate how to use spring calipers.

2. Provide spring calipers and workpieces for the students.

3. Explain the different applications of calipers.

C. JOB SHEET 3--MEASURE WITH A MICROMETER

1. Provide several workpieces and micrometers for the students

2. Use TMs 9-11 to explain how to read a micrometer.

3. Demonstrate how to use micrometers.

4. Have the students practice holding and reading the micrometer.

D. JOB SHEET 4--MEASURE WITH A VERNIER CALIPER

1. Provide several vernier calipers and workpieces for the students.

2. Use TMs 13-14 to explain how to read a venier scale.

3. Demonstrate the different applications of the vernier calipers.

Examples: Outside, inside, and depth measurement

E. JOB SHEET 5--USE A DIAL INDICATOR

1. Provide several dial indicator sets for the students.

2. Demonstrate the use of the dial indicator.

3. Discuss the different applications of the dial indicator.

VI. Unit test

A. The unit test is divided into three parts.

(NOTE: Each part covers one information sheet.)

B. Various approaches may be used in testing:

1. Give each part of the test after the student has completed studying the information on one information sheet.

2. Give the entire test upon completion of all the information sheets in the unit.

3. Give one or more parts of the test as an additional assignment or to reinforce problem areas of learning.

C. Include test parts corresponding to any information area or sheets added to the unit.

VII. Answers to the test

A. Answers are based on total information covered in the unit.

B. For convenience of grading, make corresponding answer sheets for additional test parts included.

VIII. References

A. Lascoe, Nelson, and Porter. Machineshop Operations and Setups. American Technical Society, Chicago, Illinois, 4th edition, 1973.

B. McCarthy and Smith. Machine Tool Technology. McKnight and McKnight. Bloomington, Illinois, 3rd edition, 1968.

C. Walker, John. Modern Metalworking. Goodheart-Wilcox. South Holland, Illinois, 1976.

# UNIT IX

# MEASURING AND LAYOUT

## INFORMATION SHEET 1--BASIC MEASUREMENT

I. Terms and definitions

   A. Steel rule--Semi-precision measuring instrument graduated in fractional or decimal parts of an inch.

   B. Error--Mistake in the reading or total measurement.

   C. Graduation--Marks found on rule which show unit of length.

   D. Reference point--Starting point of measurement for both the workpiece and steel rule.

   E. Reliable measure--Accurate measurement

II. Semi-precision measuring tools

   A. Types of steel rules

   (NOTE: Steel rules may vary in length and number of devisions per inch.)

      1. Spring tempered rule

      2. Flexible rule

      3. Short rule

      4. Hooked rule

   B. Types of calipers

   (NOTE: Calipers do not show graduations of measurement but are used to transfer dimensions from the workpiece to other measuring tools.)

      1. Outside calipers--For outside measurement

      2. Inside calipers--For inside measurement

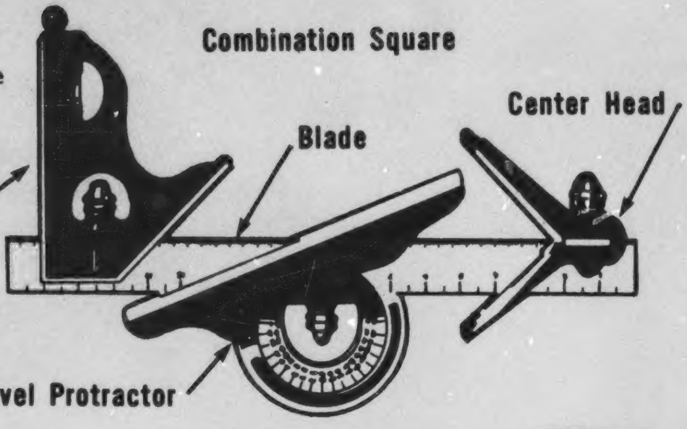
      3. Hermophrodite calipers--Used in layout work

C. Types of squares

1. T-square

2. Steel square

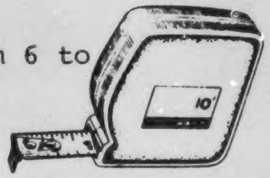
3. Combination square


Combination Square
Center Head
Blade
Square Head
Bevel Protractor

4. Try square

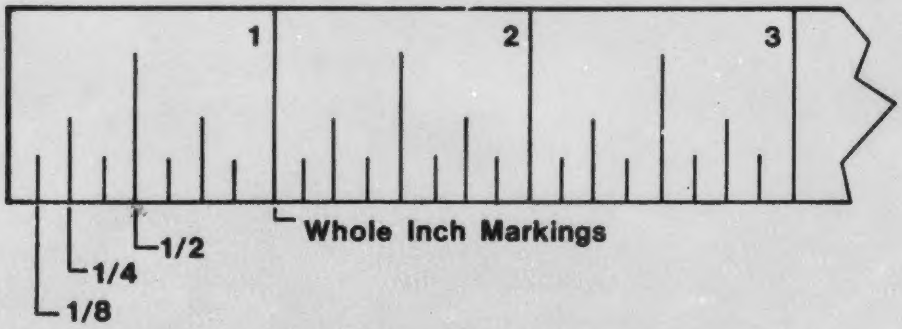
D. Tape measures

(NOTE: Tape measures may vary in length from 6 to 100-foot lengths.)

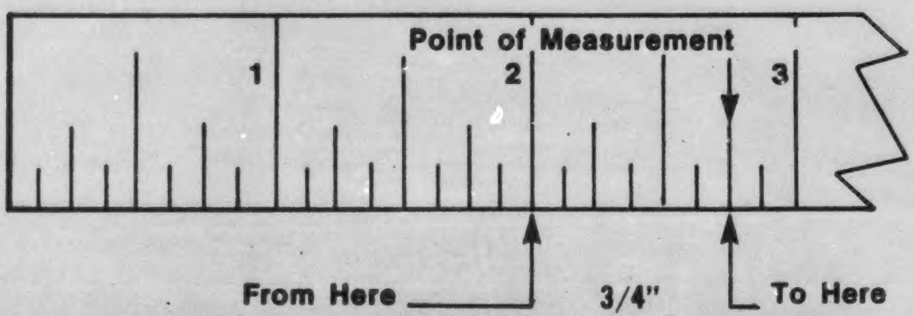


III. Reading a rule

A. Determine the size of each graduation by the length of the mark.

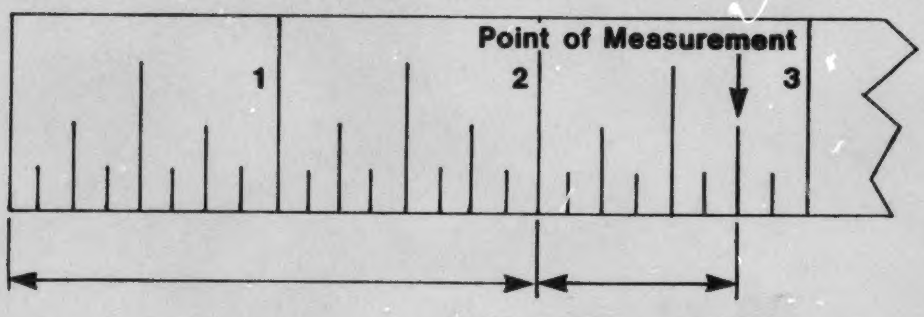

1
2
3
Whole Inch Markings
1/2
1/4
1/8

B. Count the number of divisions from the last inch mark to the point of measurement.


Point of Measurement
1
2
3
From Here
3/4"
To Here

C. Add this fraction to the whole number of inches behind the point of measurement.

(NOTE: If there are no whole numbers behind the point of measurement, the total will be the fraction of an inch.)



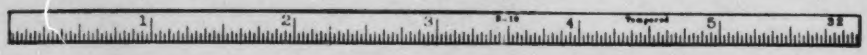
2" + 6/8" = 2 6/8"

D. Reduce if possible

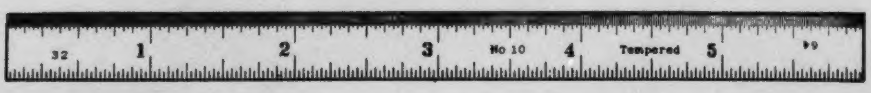
Example: 2 6/8" = 2 3/4"

# TYPES OF RULES

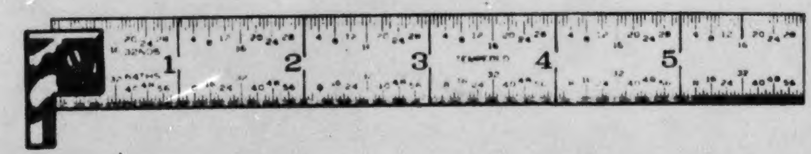
**Narrow Flexible**



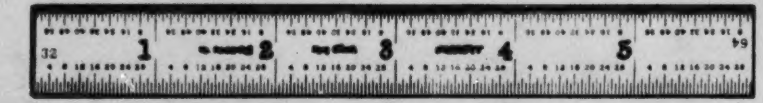
**Spring Tempered**



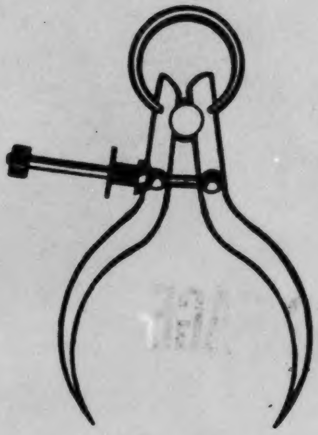
**Hook**



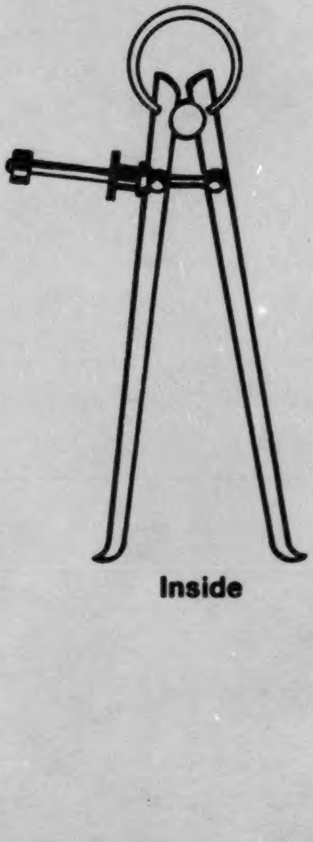
**Short**



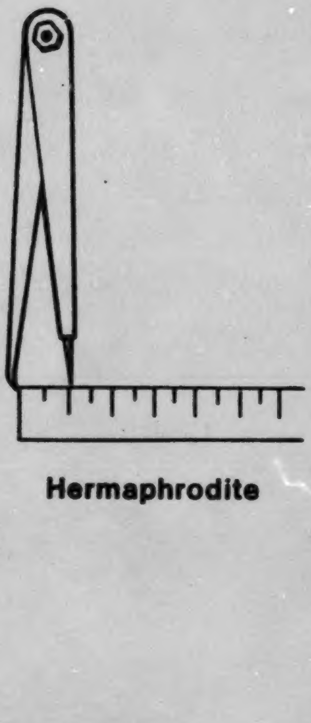
# TYPES OF CALIPERS



Outside

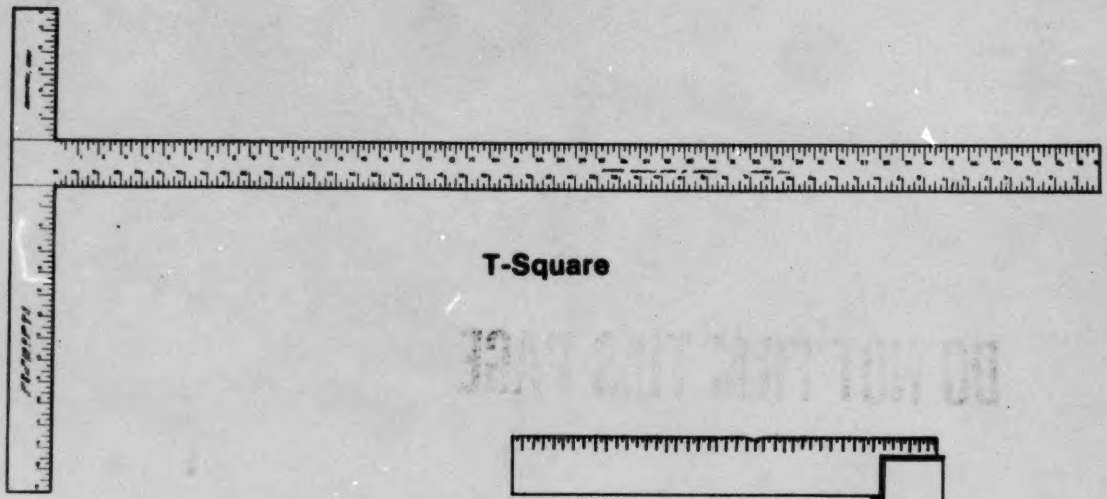


Inside

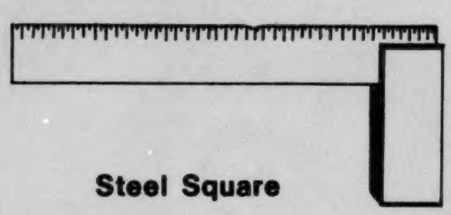


Hermaphrodite

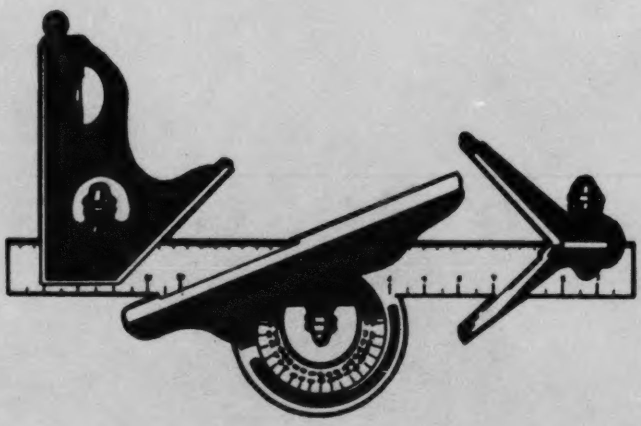
# TYPES OF SQUARES



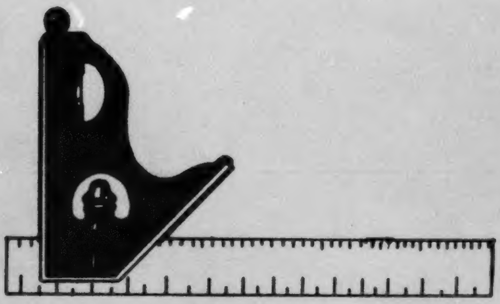
T-Square



Steel Square

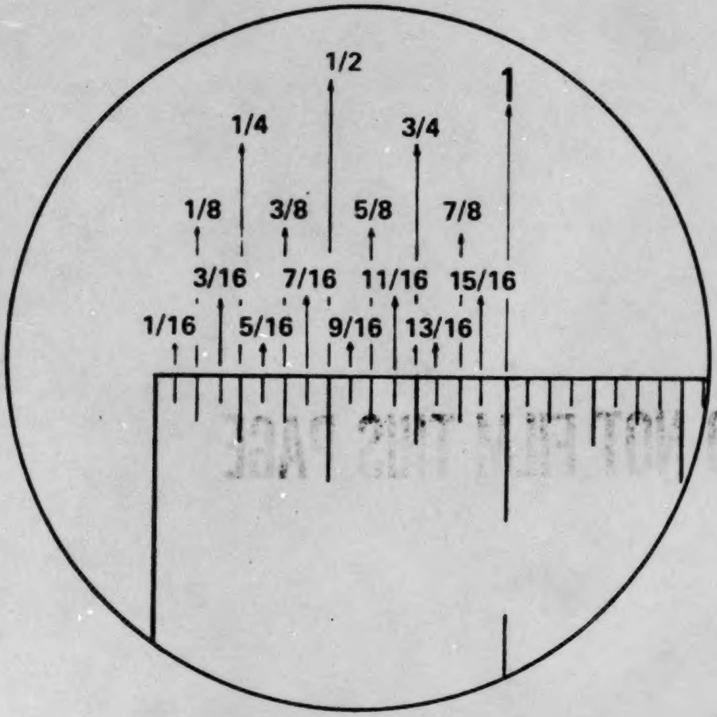


Combination Square

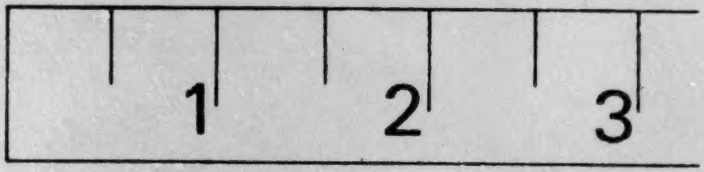


Try Square

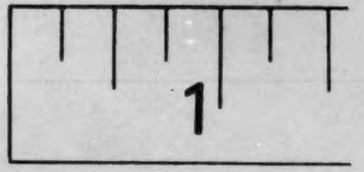
# GRADUATIONS ON A RULE


1/2
1
1/4
3/4
1/8
3/8
5/8
7/8
3/16
7/16
11/16
15/16
1/16
5/16
9/16
13/16

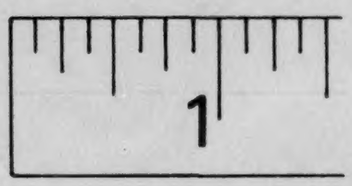
**Halves**



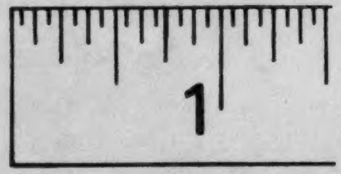
**Quarters**



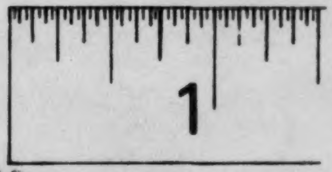
**Eighths**



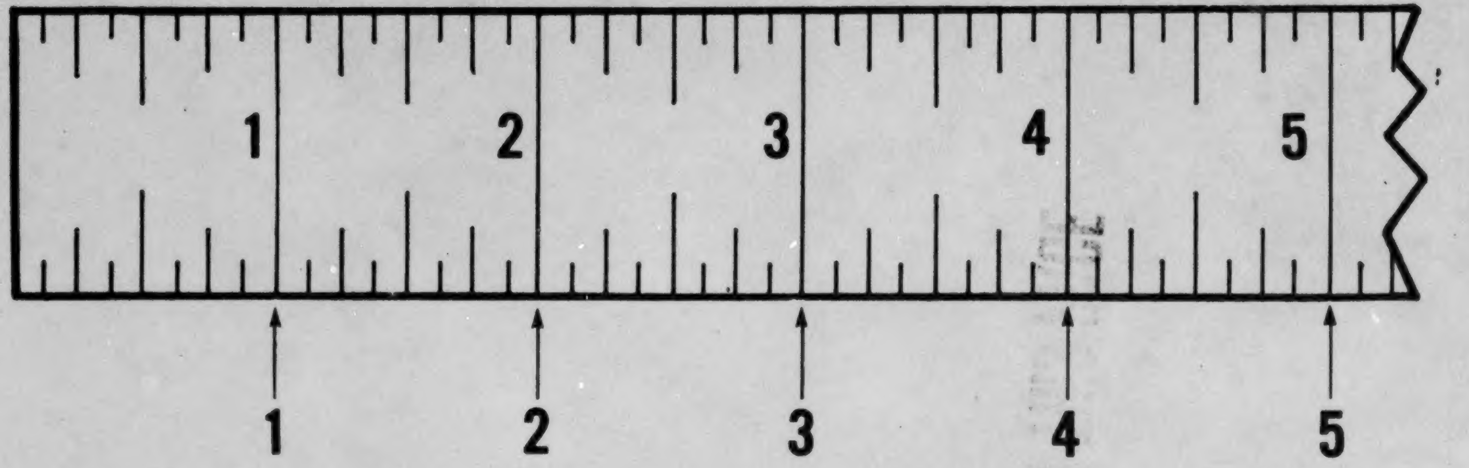
**Sixteenths**



**Thirty-Seconds**

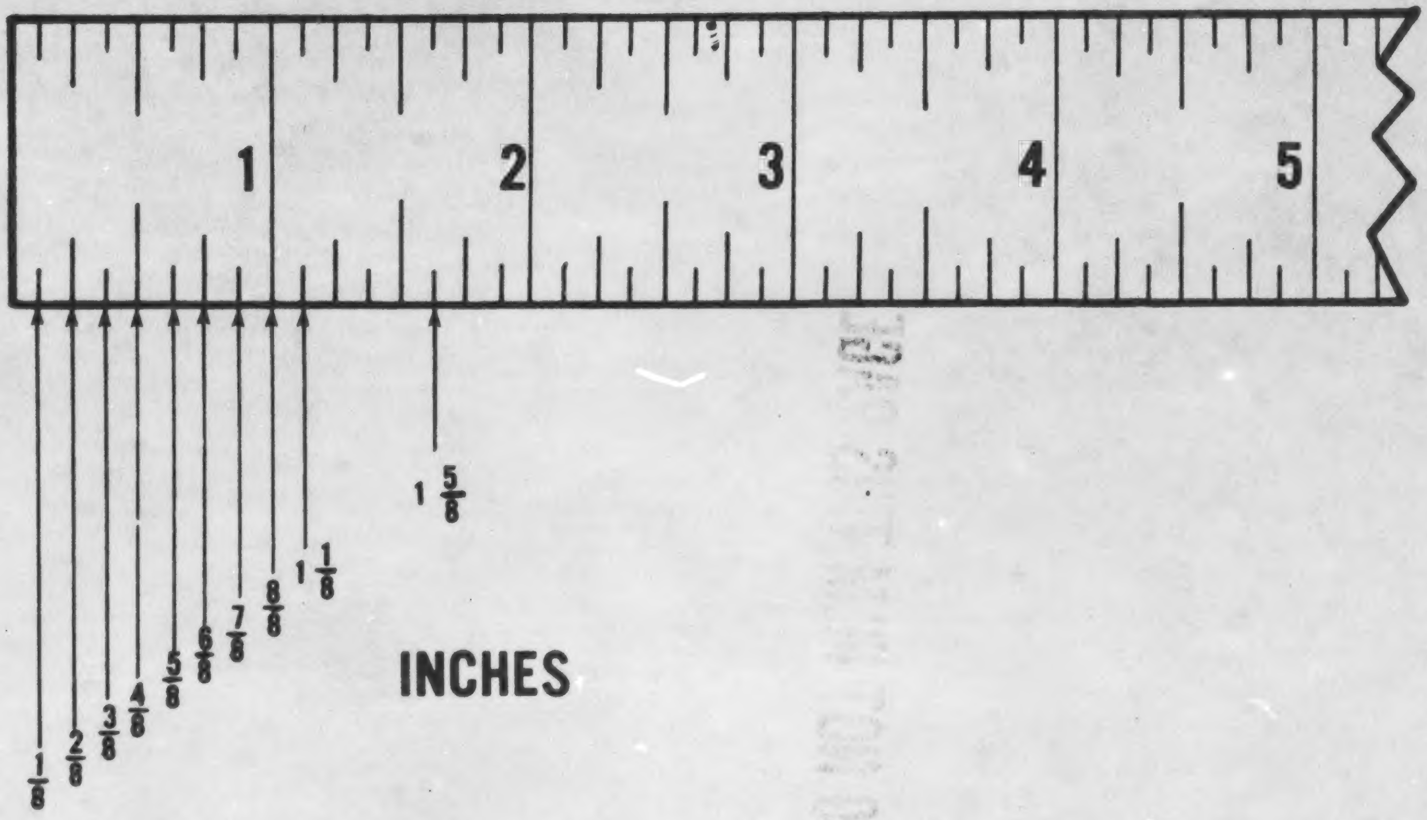


# READING WHOLE NUMBERS ON A RULE

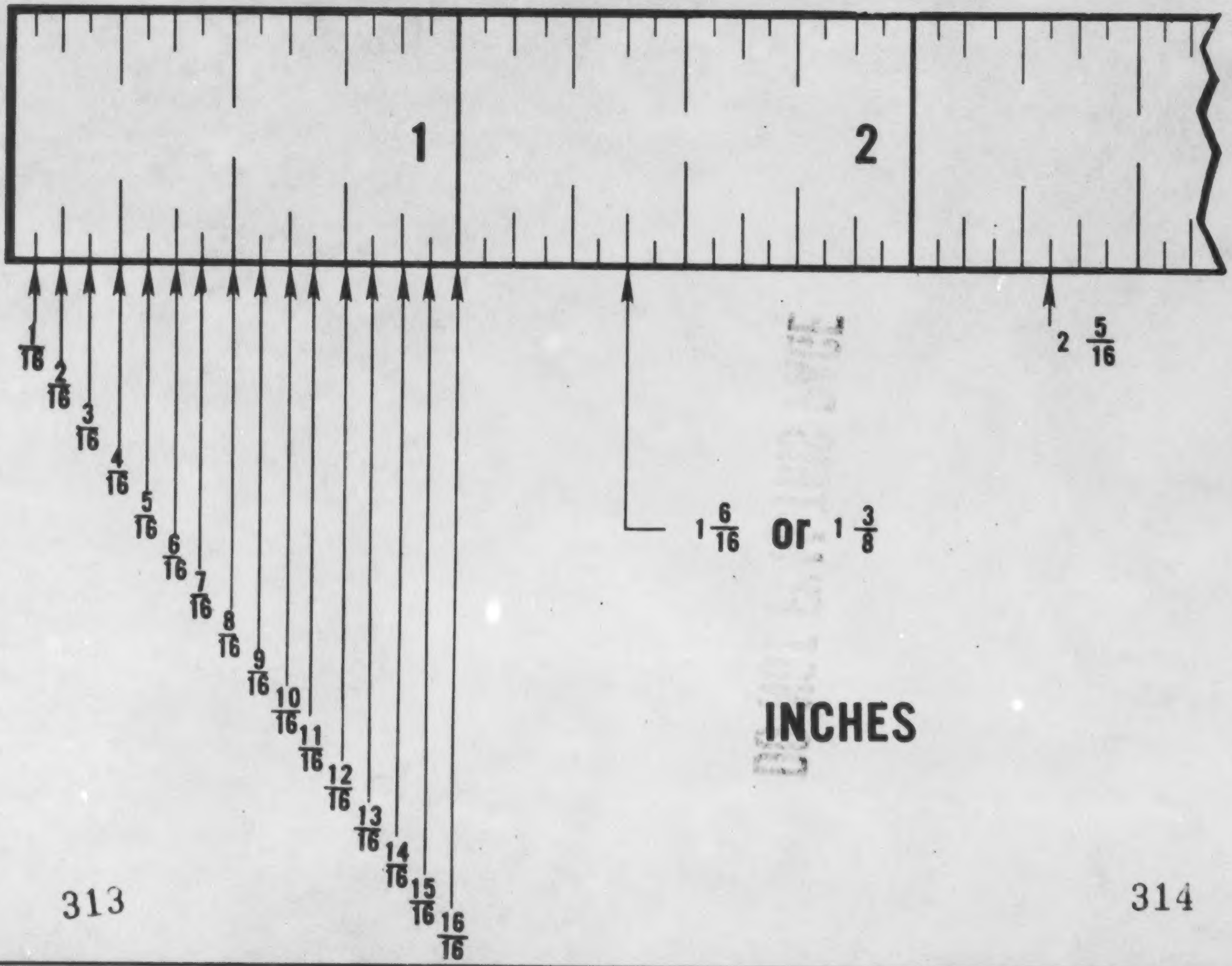

1
2
3
4
5
1
2
3
4
5

INCHES

# READING EIGHTHS ON A RULE


1
2
3
4
5
1/8
2/8
3/8
4/8
5/8
6/8
7/8
8/8
1 1/8
1 5/8
INCHES

# READING SIXTEENTHS ON A RULE


1
2
1/16
2/16
3/16
4/16
5/16
6/16
7/16
8/16
9/16
10/16
11/16
12/16
13/16
14/16
15/16
16/16
1 6/16 or 1 3/8
2 5/16
INCHES

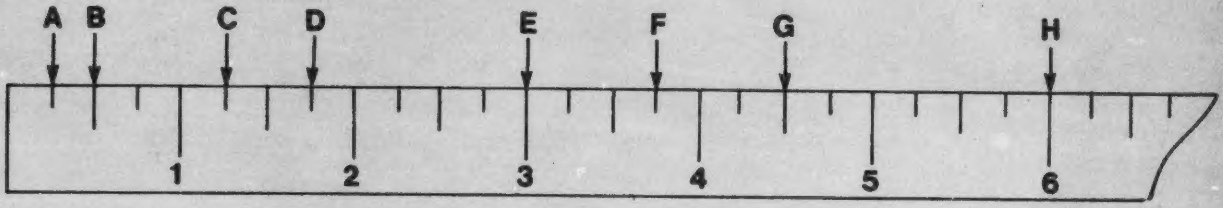
# UNIT IX

# MEASURING AND LAYOUT

## ASSIGNMENT SHEET 1--READING THE RULE

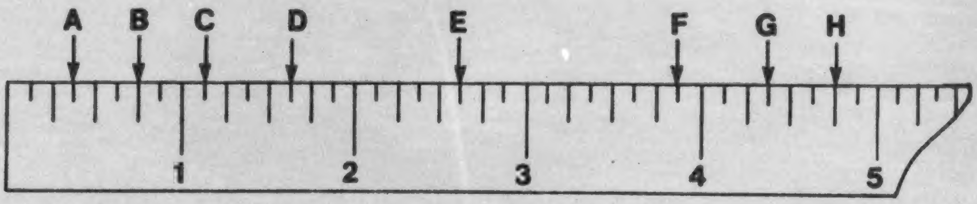
Directions: Read the rules below from the left side (0) and write down the measurement. Reduce fractions to the lowest form.

A. Use the drawing below and read the rule to the nearest one-fourth inch.



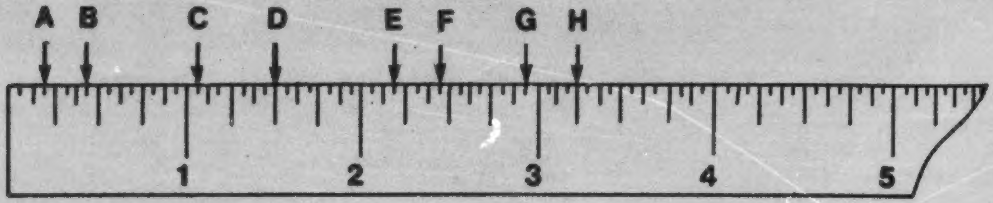
1. 0-A = ____________
2. 0-B = ____________ or ____________
3. 0-C = ____________
4. 0-D = ____________
5. 0-E = ____________
6. 0-F = ____________
7. 0-G = ____________
8. 0-H = ____________
9. E-H = ____________
10. D-G = ____________

B. Look at the drawing below and read the rule to the nearest one-eighth inch.



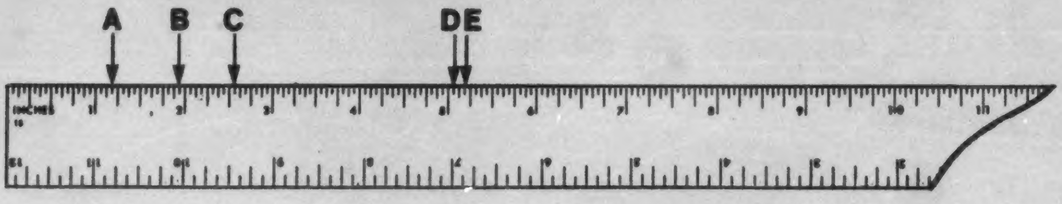
1. 0-A = ____________
2. 0-B = ____________ or ________
3. 0-C = ____________
4. 0-D = ____________
5. 0-E = ____________
6. 0-F = ____________
7. 0-G = ____________
8. 0-H = ____________ or ________
9. B-D = ____________
10. A-G = ____________ or ________

C. Look at the drawing below and read the rule to the nearest one-sixteenth inch.



1. 0-A = ________
2. 0-B = ________
3. 0-C = ________
4. 0-D = ________ or ________
5. 0-E = ________
6. 0-F = ________
7. 0-G = ________
8. 0-H = ________ or ________
9. D-E = ________
10. A-B = ________ or ________

D. Look at the drawing below and read the rule to the nearest one-sixteenth inch.



1. 0-A = ________
2. 0-B = ________
3. 0-C = ________
4. 0-D = ________
5. 0-E = ________
6. A-B = ________
7. B-C = ________
8. A-D = ________

# UNIT IX

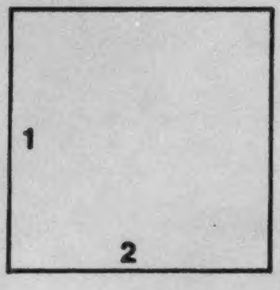
# MEASURING AND LAYOUT

## ASSIGNMENT SHEET 2--MEASURING OBJECTS

Directions: Use a ruler to find the lengths shown on the following drawings. Write each dimension in the blank on the left.

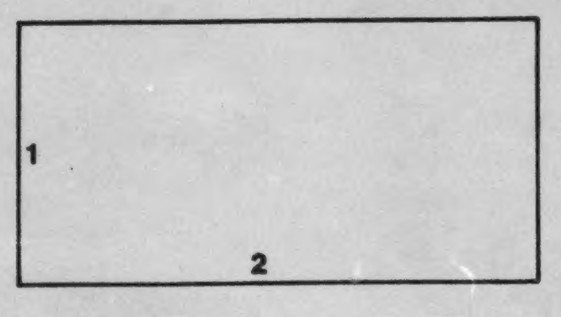
A. 1. ________

2. ________



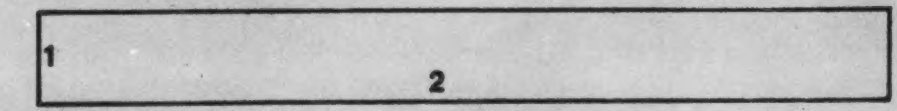
B. 1. ________

2. ________



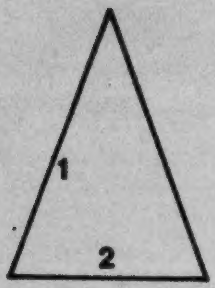
C. 1. ________

2. ________



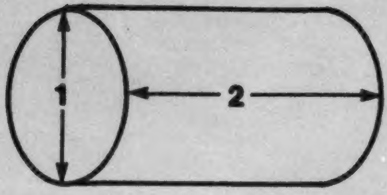
D. 1. ________

2. ________



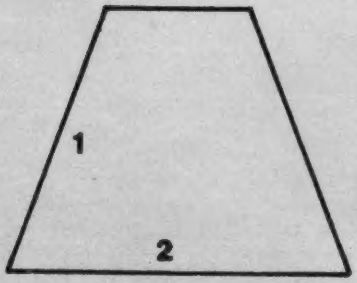
E. 1. ________

2. ________



F. 1. ________

2. ________



# UNIT IX

# MEASURING AND LAYOUT

## ASSIGNMENT SHEET 3--DRAWING LINES AND OBJECTS

Directions: Using a ruler, draw the following according to the lengths given.

A. Lines the following lengths

1. 1 1/2"
2. 2 1/4"
3. 3 1/8"
4. 3 3/16"
5. 4 15/16"

B. Squares with each side

1. 2"

2. 1 3/8"

C. Triangles with sides

1. 1 3/4" x 1 3/4" x 2"

2. 1 7/8" x 1" x 1 7/8"

## UNIT IX

## MEASURING AND LAYOUT

### ASSIGNMENT SHEET 4--REDUCING MEASUREMENTS

Directions: Reduce each of the following lengths to their smallest form. Use feet and inches for each. Use back of page for figuring.

A. 13 inches = _____ foot _____ inches

B. 15 inches = _____ foot _____ inches

C. 9 inches = _____ feet _____ inches

D. 25 inches = _____ feet _____ inch

E. 16 3/4 inches = _____ feet _____ inches

F. 19 7/8 inches = _____ feet _____ inches

G. 21 15/16 inches = _____ feet _____ inches

H. 5 4/8 inches = _____ feet _____ inches

I. 26 6/8 inches = _____ feet _____ inches

J. 11 14/16 inches = _____ feet _____ inches

K. 30 15/16 inches = _____ feet _____ inches

L. 34 2/8 inches = _____ feet _____ inches

M. 8 16/8 inches = _____ feet _____ inches

N. 21 11/4 inches = _____ feet _____ inches

O. 48 17/16 inches = _____ feet _____ inches

P. 72 inches = _____ feet _____ inches

Q. 96 inches = _____ feet _____ inches

R. 120 inches = _____ feet _____ inches

S. 168 inches = _____ feet _____ inches

T. 1 yard 19 21/16 inches = _____ feet _____ inches

# UNIT IX

# MEASURING AND LAYOUT

## INFORMATION SHEET 2--PRECISION MEASUREMENT TOOLS

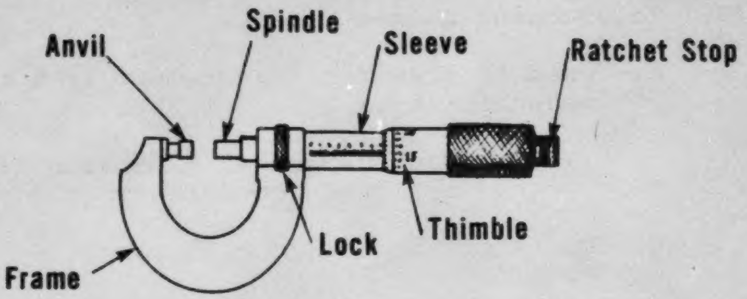
I. Micrometers

A. Types of micrometers

1. Outside micrometers
2. Inside micrometers
3. Depth micrometers
4. Screw thread micrometers

B. Parts of a micrometer

1. Frame
2. Anvil
3. Spindle
4. Lock
5. Sleeve
6. Thimble
7. Ratchet stop

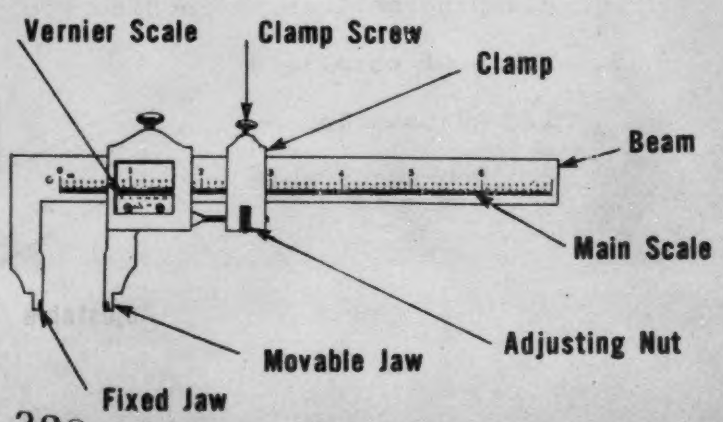

Anvil
Spindle
Sleeve
Ratchet Stop
Lock
Thimble
Frame

II. Vernier measuring tools

(NOTE: Many vernier tools have a dial readout rather than the vernier scale.)

A. Parts of vernier calipers--used for measuring inside and outside dimensions.

1. Fixed jaw
2. Movable jaw
3. Beam
4. Clamp
5. Clamp screw
6. Main scale
7. Vernier scale
8. Adjusting nut


Vernier Scale
Clamp Screw
Clamp
Beam
Main Scale
Adjusting Nut
Movable Jaw
Fixed Jaw

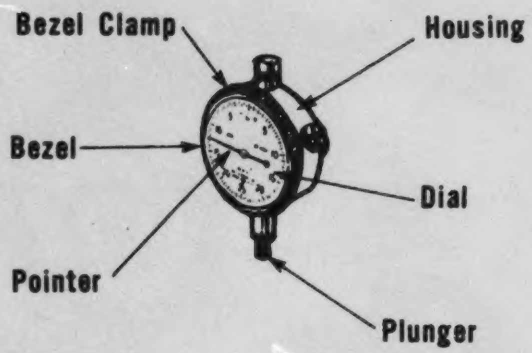
B. Vernier height gauge--Used on a surface plate for layout and checking height of a workpiece.

III. Dial indicator

A. Used to check alignment of workpieces or machine parts

B. Parts of the dial indicator

1. Housing
2. Dial
3. Pointer
4. Plunger
5. Bezel
6. Bezel clamp


Bezel Clamp
Housing
Bezel
Dial
Pointer
Plunger

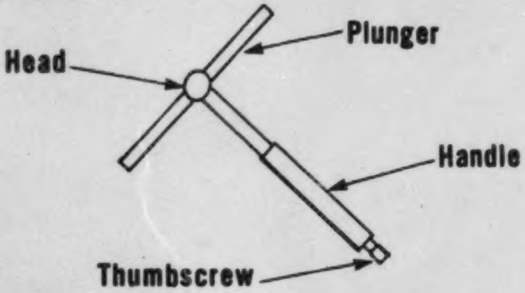
IV. Telescoping gauges

A. Used to transfer measurement from the workpiece to the measuring tool.

(NOTE: Each gauge has dimension limits so should be selected according to the size to be measured.)

B. Parts of the telescoping gauge

1. Head
2. Handle
3. Plunger
4. Thumbscrew

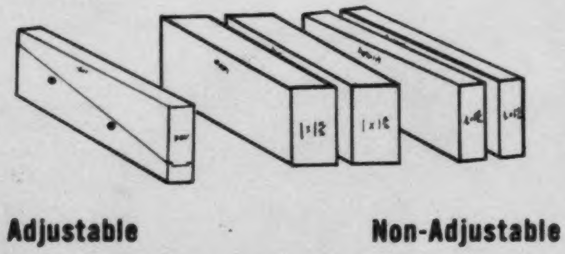

Plunger
Head
Handle
Thumbscrew

V. Parallel bars

A. Used to align and space workpieces in vises or when using clamping devices on machine tools.

B. Types of parallels

1. Adjustable
2. Non-adjustable


Adjustable
Non-Adjustable

## VI. Gauge blocks

(NOTE: Often called Jo or Webber blocks, which refer to the manufacturer.)

A. Rectangular blocks of tool steel that are carefully hardened and finished so that they may be placed together to provide an accurate dimension to use to check measuring tools.

B. Sizes of gauge blocks vary by set.

Examples of sets:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 9-BLOCK SET: One ten-thousandth inch | | | | | | | | | |
| 0.1001 | 0.1002 | 0.1003 | 0.1004 | 0.1005 | 0.1006 | 0.1007 | 0.1008 | 0.1009 | |
| 49-BLOCK SET: One-thousandth inch | | | | | | | | | |
| 0.101 | 0.102 | 0.103 | 0.104 | 0.105 | 0.106 | 0.107 | 0.108 | 0.109 | 0.110 |
| 0.111 | 0.112 | 0.113 | 0.114 | 0.115 | 0.116 | 0.117 | 0.118 | 0.119 | 0.120 |
| 0.121 | 0.122 | 0.123 | 0.124 | 0.125 | 0.126 | 0.127 | 0.128 | 0.129 | 0.130 |
| 0.131 | 0.132 | 0.133 | 0.134 | 0.135 | 0.136 | 0.137 | 0.138 | 0.139 | 0.140 |
| 0.141 | 0.142 | 0.143 | 0.144 | 0.145 | 0.146 | 0.147 | 0.148 | 0.149 | |
| 19-BLOCK SETS: Fifty-thousandths inch | | | | | | | | | |
| 0.050 | 0.100 | 0.150 | 0.200 | 0.250 | 0.300 | 0.350 | 0.400 | 0.450 | 0.500 |
| 0.550 | 0.600 | 0.650 | 0.700 | 0.750 | 0.800 | 0.850 | 0.900 | 0.950 | |
| 4-BLOCK SET: One inch | | | | | | | | | |
| | | 1.000 | | 2.000 | | 3.000 | 4.000 | | |

## VII. Gauges

A. Used to check parts to see if they were made within the required limits, without using a measuring tool that shows unit measurement.

B. Types of gauges

1. Plug gauge--Checks hole diameters.
2. Go and no-go gauge--Checks the upper and the lower dimension limits of a part.
3. Ring gauge--Checks external diameters.
4. Snap gauge--Used as a ring gauge.

5. Thread plug and ring gauge--Checks threads for the correct thread fit.

6. Radius and fillet gauge--Checks radius on inside and outside corners.

7. Screw pitch gauge--Checks number of threads per inch.

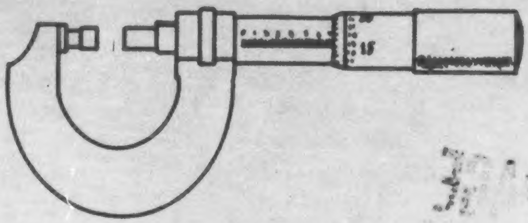
8. Center gauge--Checks thread-cutting tools for proper grinding angles and alignment on machine tools.

9. Drill-point gauge--Checks drill-points for the correct 59° angle.

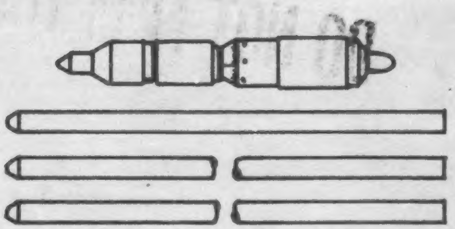
VIII. Sine bar--A tool used to measure angles, bevels, or tapers by applying rules about triangles.

(NOTE: The relation of the angles in a triangle and the length of the sides can be figured by a standard ratio.)

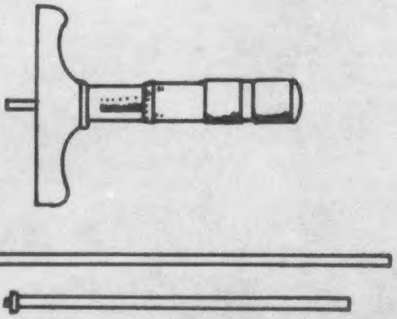
# TYPES OF MICROMETERS



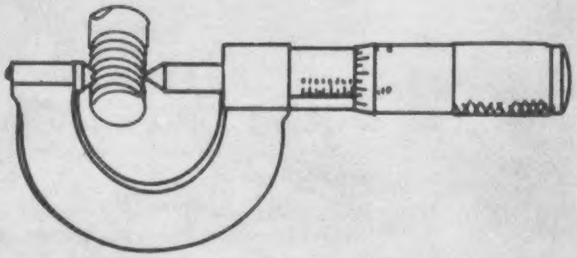
Outside Micrometer



Inside Micrometer and Extension Rods

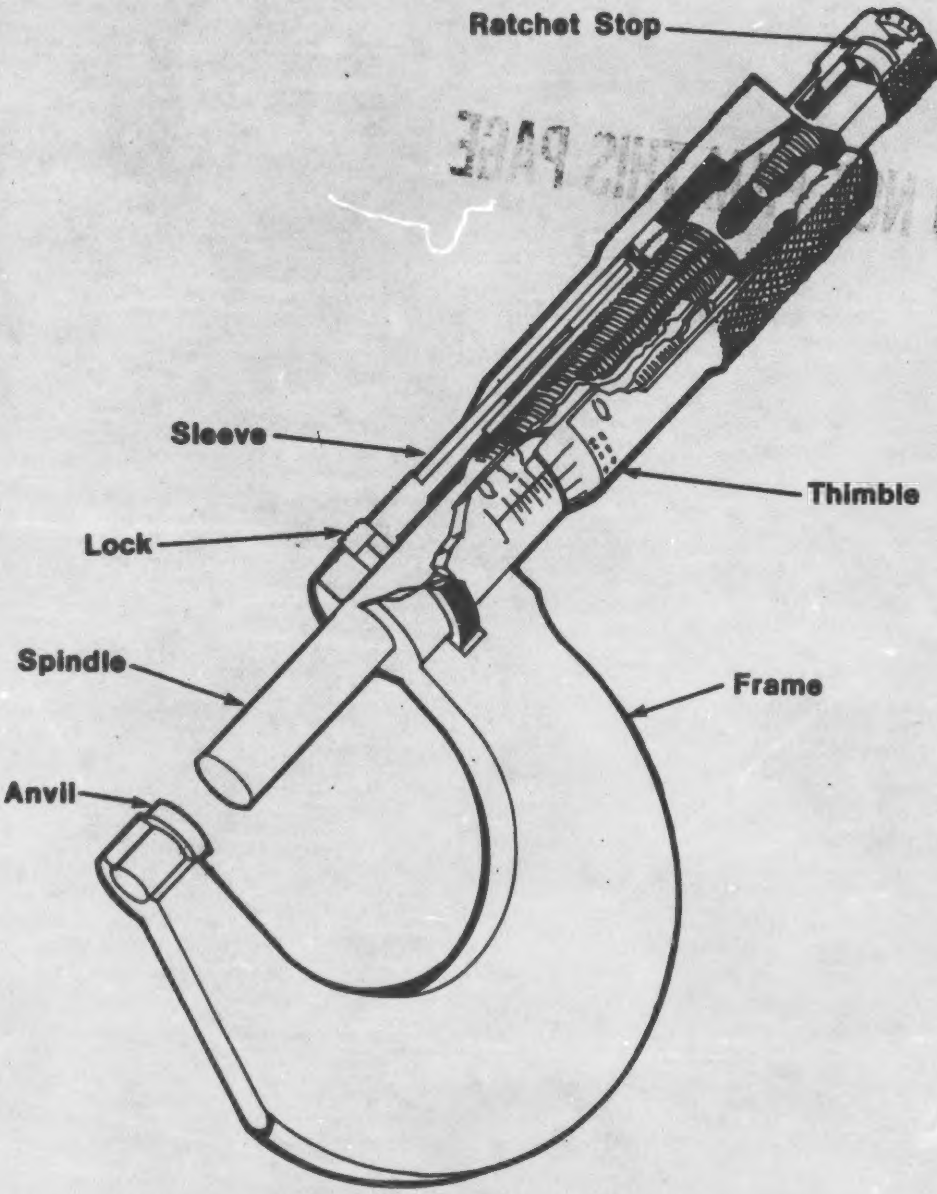


Depth Micrometer and Extension Rods

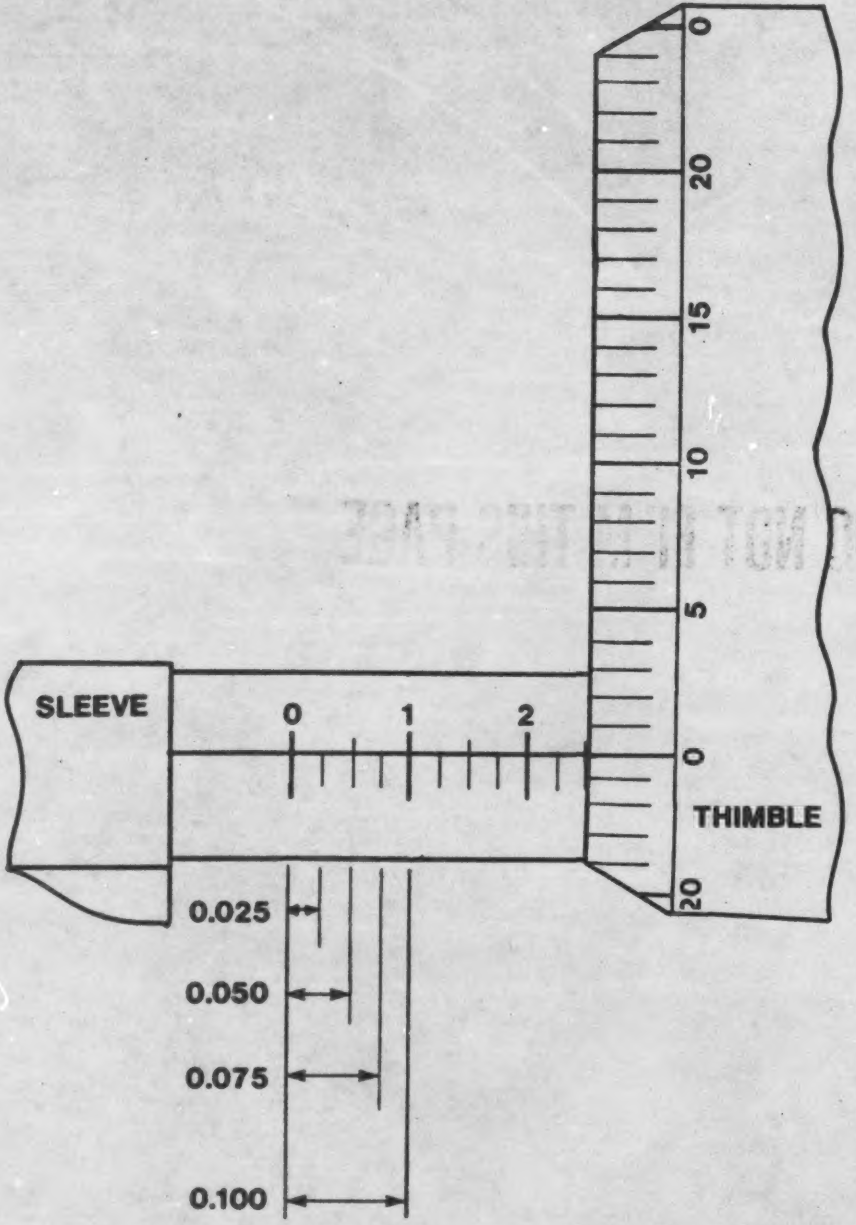


Screw Thread Micrometer

# PARTS OF A MICROMETER

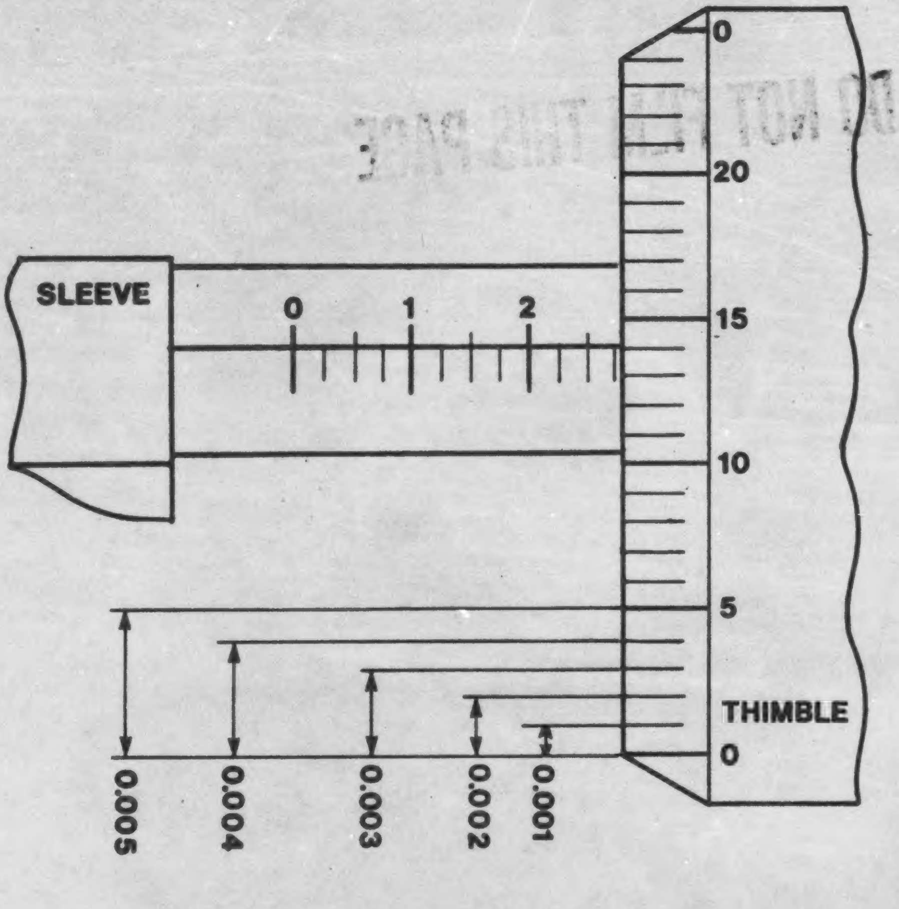

Ratchet Stop
Sleeve
Thimble
Lock
Spindle
Frame
Anvil

# SLEEVE GRADUATIONS

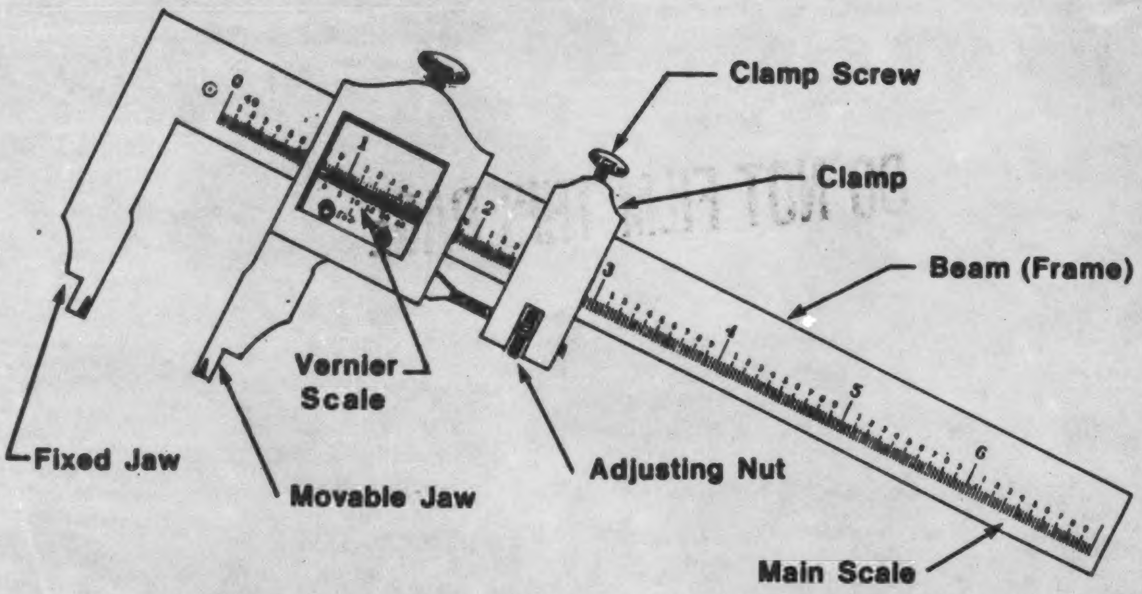

0
20
15
10
5
SLEEVE
0
1
2
0
THIMBLE
20
0.025
0.050
0.075
0.100

# THIMBLE GRADUATIONS

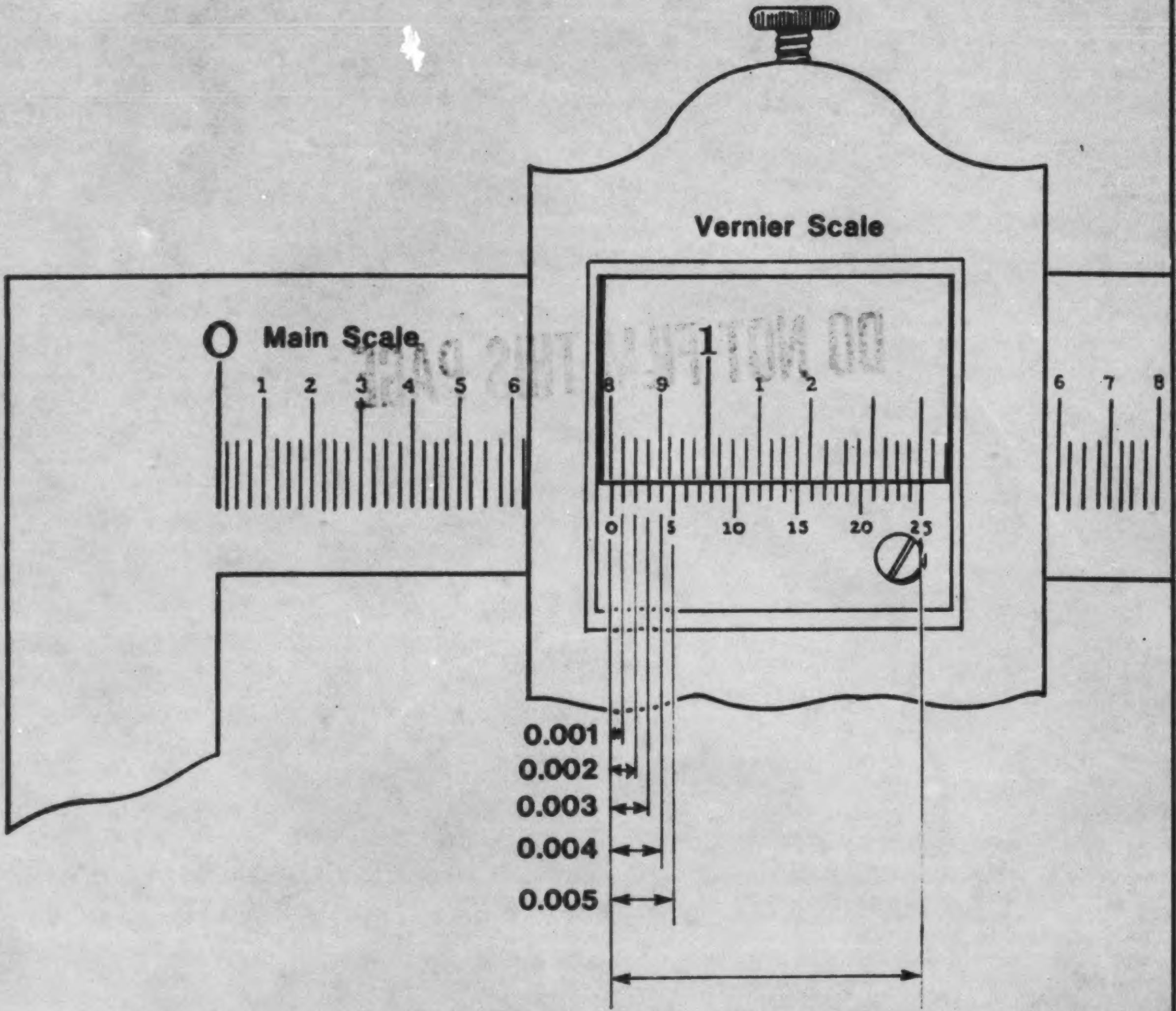
Thimble has 25 Graduations to 24 on the Sleeve Scale


SLEEVE
0
1
2
0
20
15
10
5
THIMBLE
0
0.005
0.004
0.003
0.002
0.001

# PARTS OF VERNIER CALIPERS

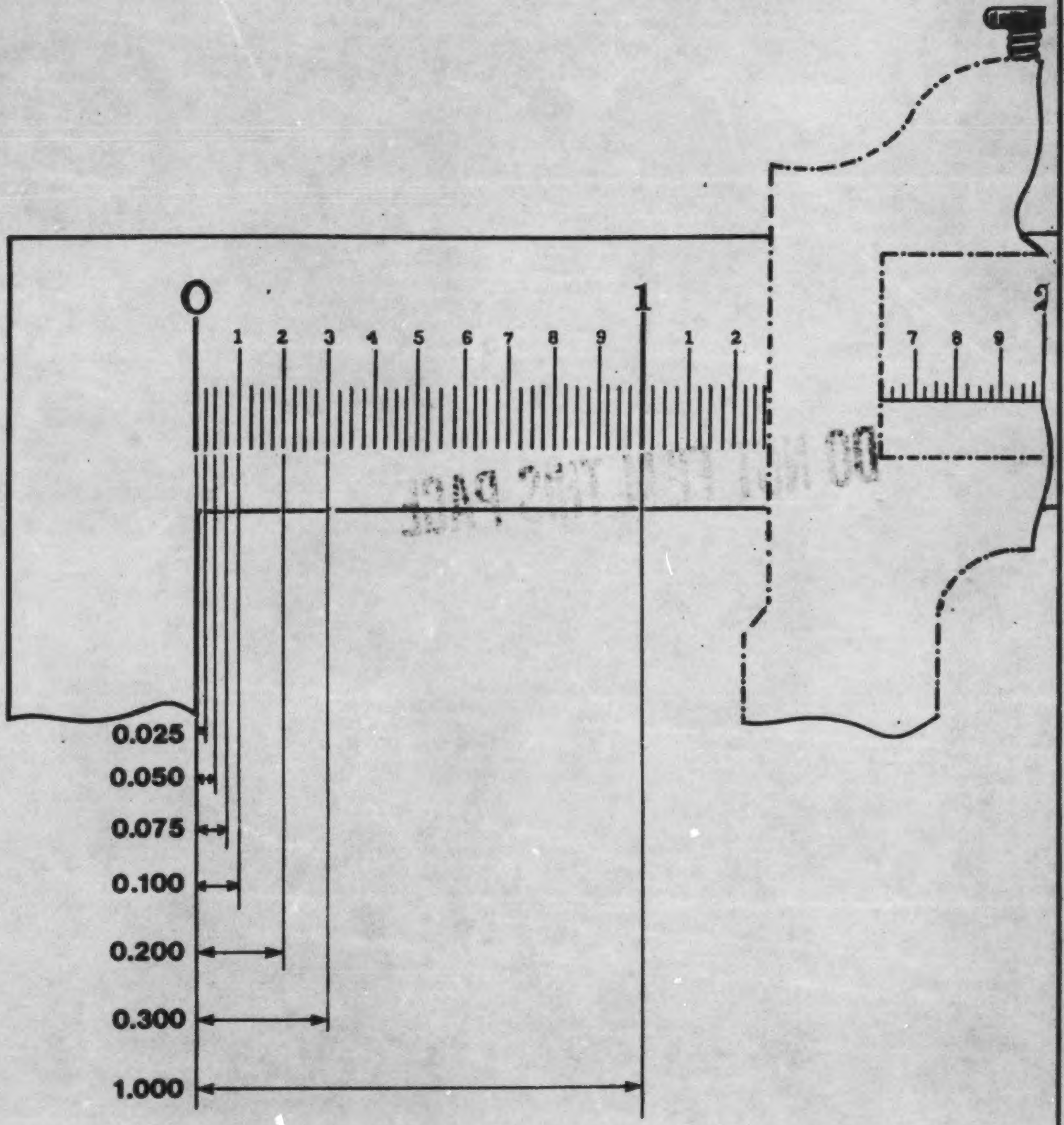

Clamp Screw
Clamp
Beam (Frame)
Vernier Scale
Fixed Jaw
Movable Jaw
Adjusting Nut
Main Scale
0
1
2
3
4
5
6

# VERNIER SCALE GRADUATIONS

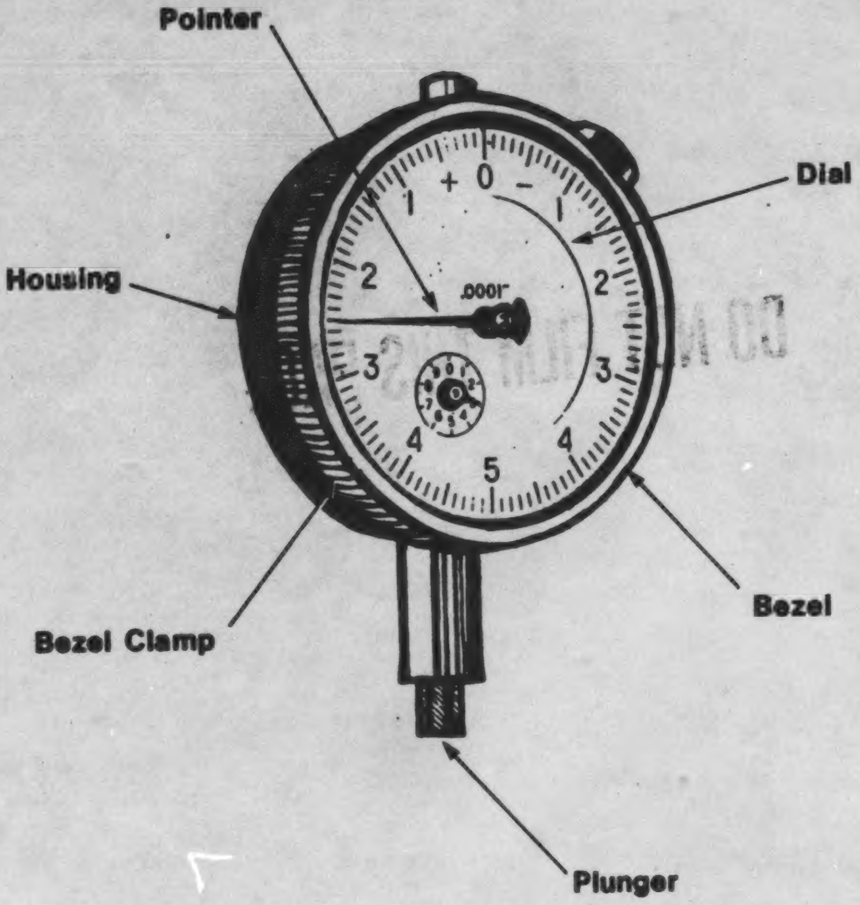

Vernier Scale
0
Main Scale
1
1
2
3
4
5
6
8
9
1
2
6
7
8
0
5
10
15
20
25
0.001
0.002
0.003
0.004
0.005

Vernier Scale has 25
Graduations Per 24
on the Main Scale

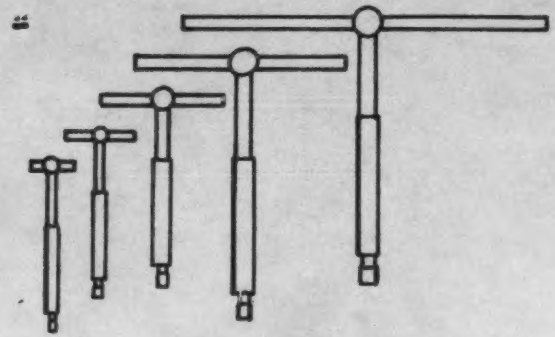
# BEAM GRADUATIONS


0
1
2
1
2
3
4
5
6
7
8
9
1
2
7
8
9
0.025
0.050
0.075
0.100
0.200
0.300
1.000

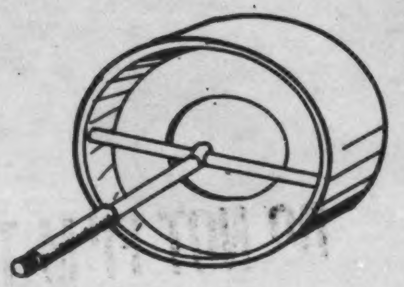
# PARTS OF A DIAL INDICATOR


Pointer
Dial
Housing
+ 0 –
1
2
3
4
5
.0001"
Bezel
Bezel Clamp
Plunger

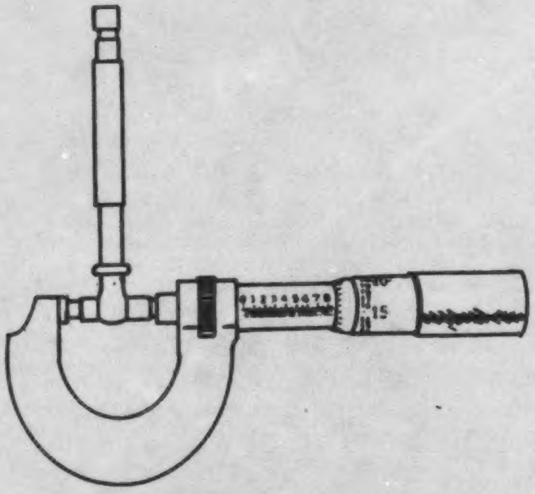
# HOLE GAUGES



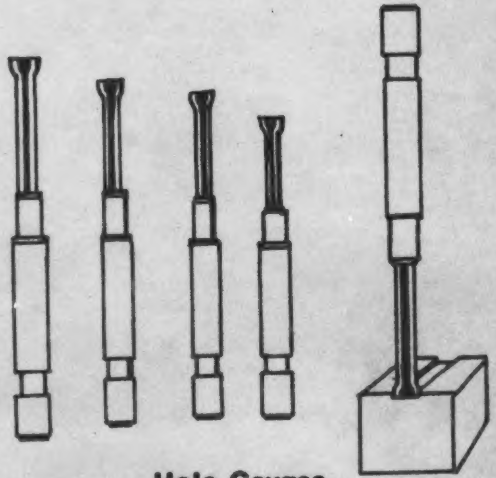
Telescoping Gauges



Using a telescoping gauge

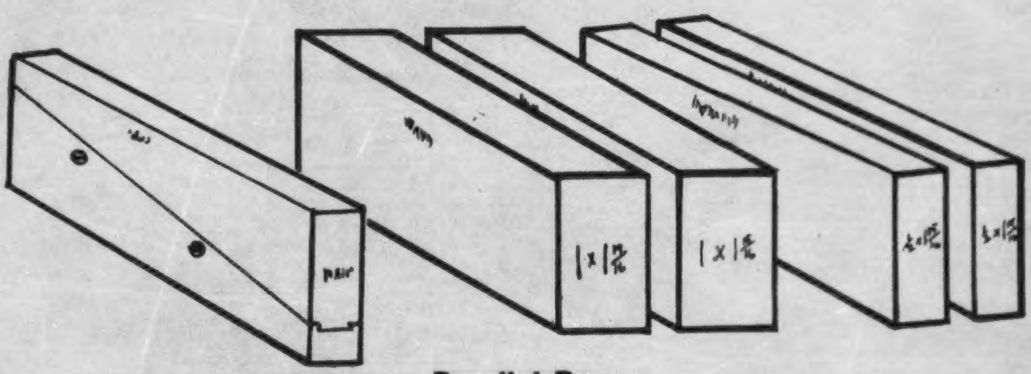

0 1 2 3 4 5 6 7 8
10
15

Measuring a telescoping gauge



Hole Gauges

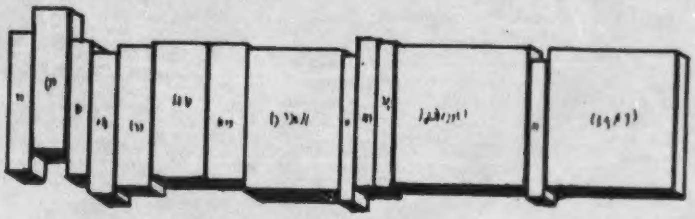
# OTHER MEASURING TOOLS



Parallel Bars

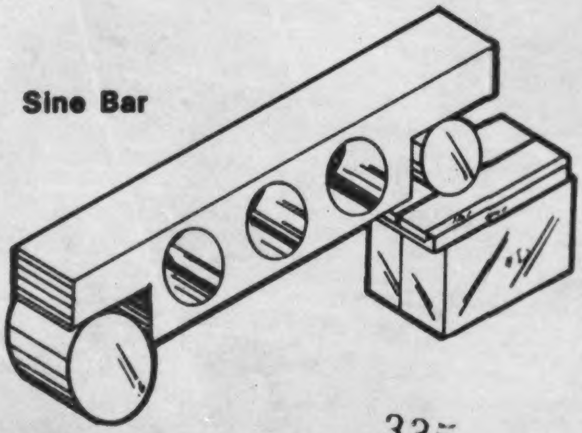
Adjustable

Non-Adjustable



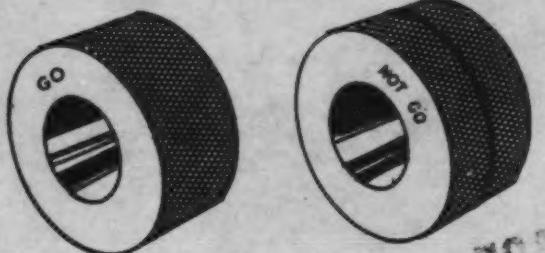
Gauge Blocks
(wrung together)

Sine Bar

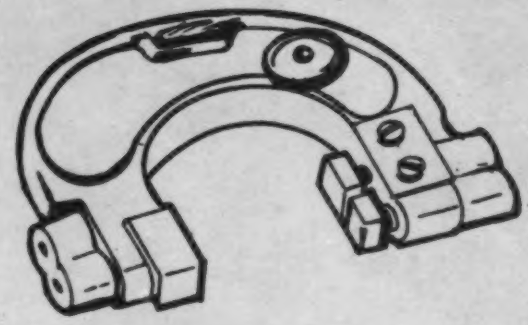


# MEASURING TOOLS (Cont.)

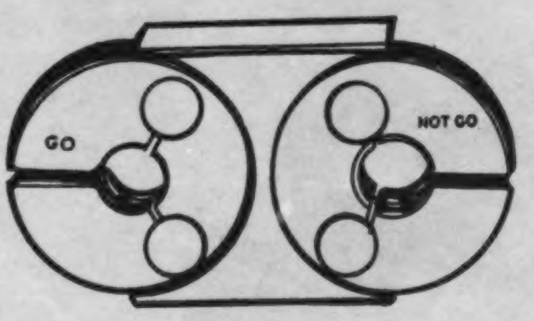
## GO AND NO-GO GAUGES

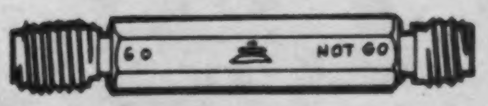


Ring Gauges

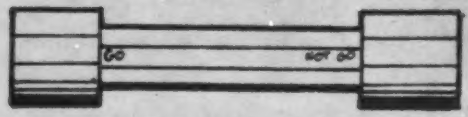


Snap Gauge



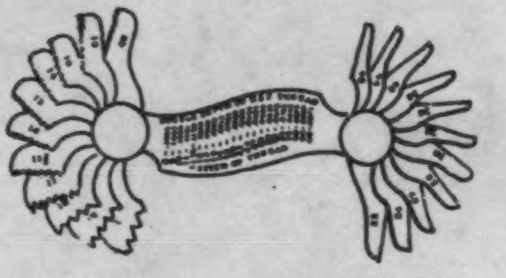


Thread Ring and Plug Gauge



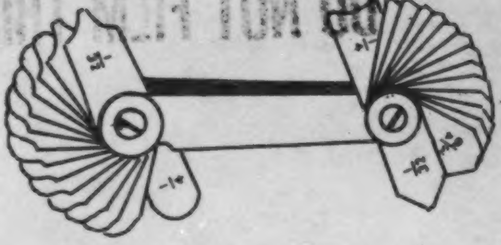
Plug Gauge

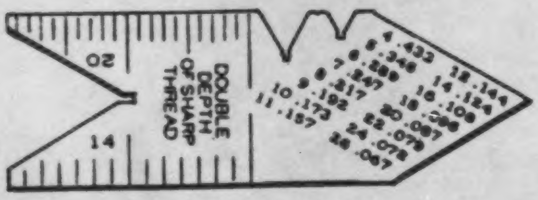
# MEASURING TOOLS (Cont.)



**Screw Pitch Gauge**

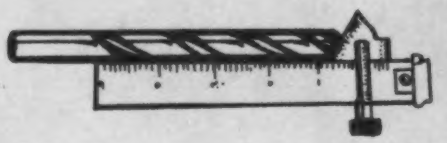
**Radius or Fillet Gauge**



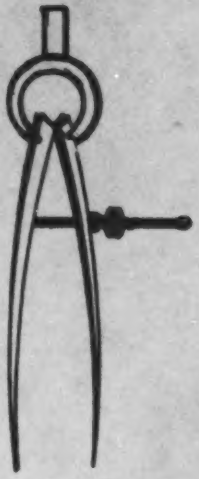

20
14
DOUBLE DEPTH OF SHARP THREAD
4 .433
5 .346
6 .289
7 .247
8 .217
9 .192
10 .173
11 .157
12 .144
14 .124
16 .108
18 .096
20 .087
22 .079
24 .072
26 .067

**Center Gauge**

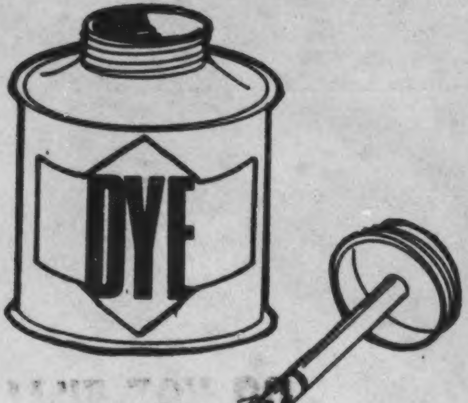
**Drill Point Gauge**



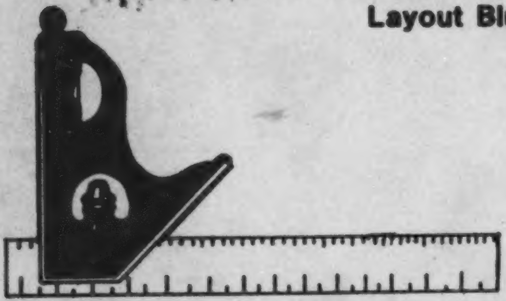
# LAYOUT EQUIPMENT



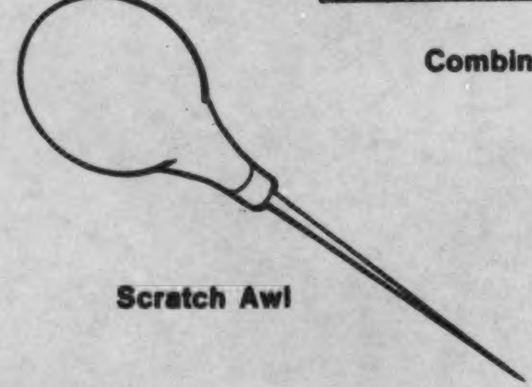
Dividers



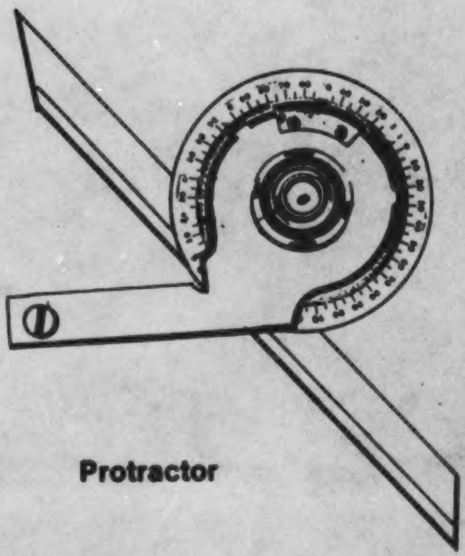
Layout Blue



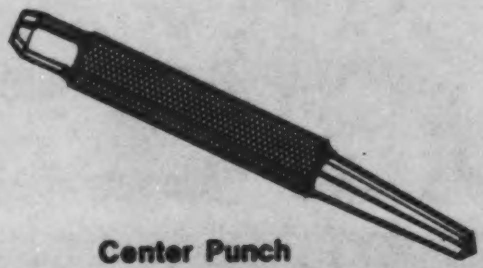
Combination Square



Scratch Awl



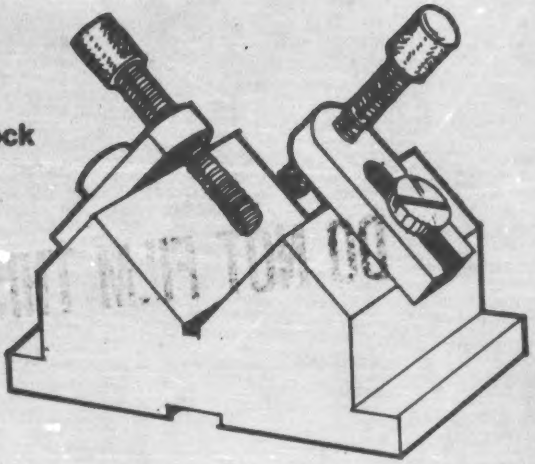
Protractor

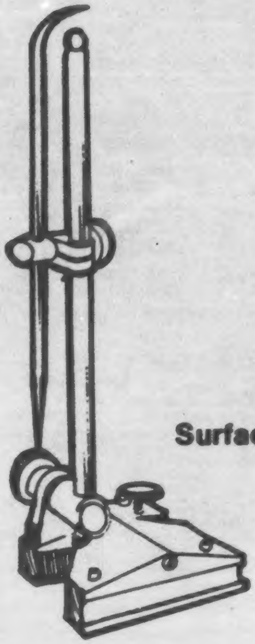


Center Punch

# LAYOUT EQUIPMENT ( Cont.)

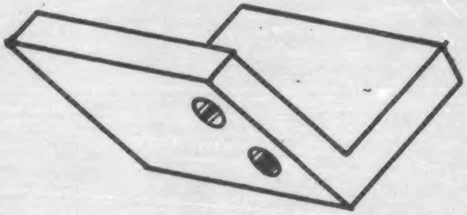
**V-Block**



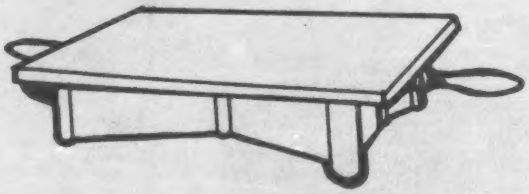


**Surface Gauge**

**Angle Plate**



**Surface Plate**



# UNIT IX

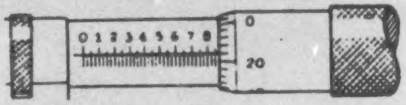
# MEASURING AND LAYOUT

## ASSIGNMENT SHEET 5--READING THE MICROMETER

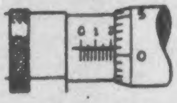
Directions: Read the plain micrometer settings below and write the correct answers in the blanks provided.

Answers

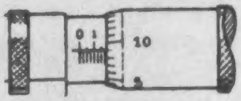
A. ____________________


0 1 2 3 4 5 6 7 8
0
20

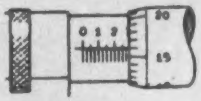
B. ____________________



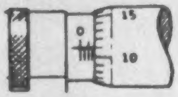
C. ____________________



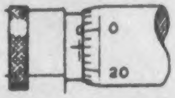
D. ____________________



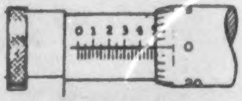
E. ____________________



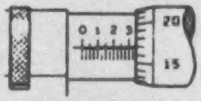
F. ____________________



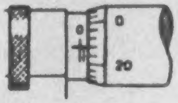
G. ____________________



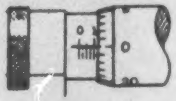
H. ____________________



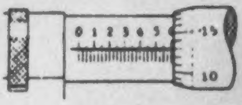
I. ____________________



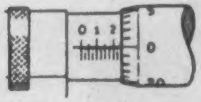
J. ____________________



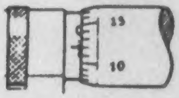
K. ____________________


0 1 2 3 4 5
15
10

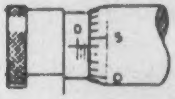
L. ____________________



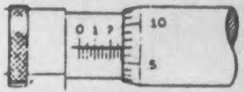
M. ____________________



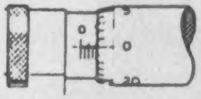
N. ____________________



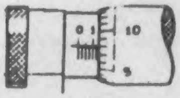
O. ____________________



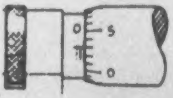
P. ____________________



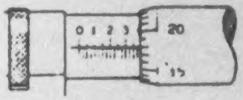
Q. ____________________



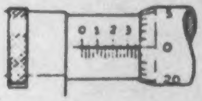
R. ____________________



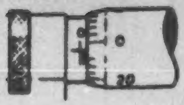
S. ____________________



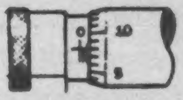
T. ____________________



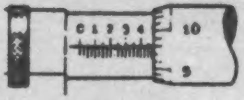
U. ______________



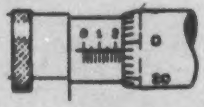
V. ______________



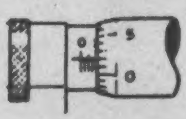
W. ______________



X. ______________



Y. ______________



## UNIT IX

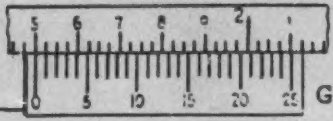
## MEASURING AND LAYOUT

### ASSIGNMENT SHEET 6--READ VERNIER CALIPER SETTINGS

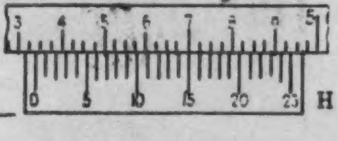
Directions: Read the vernier caliper settings shown below and write the correct answer in the blanks on the left.

Answers

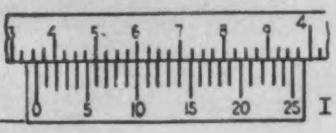
A. ______________


5 6 7 8 9 2 1
0 5 10 15 20 25

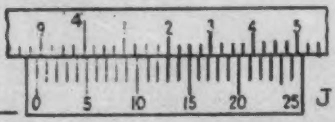
B. ______________


3 4 5 6 7 8 9 5
0 5 10 15 20 25

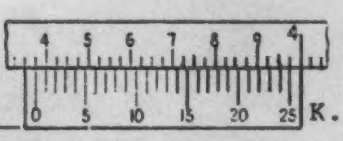
C. ______________


3 4 5 6 7 8 9 4
0 5 10 15 20 25

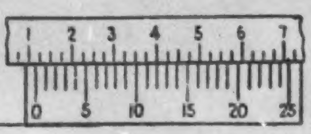
D. ______________


9 4 1 2 3 4 5
0 5 10 15 20 25

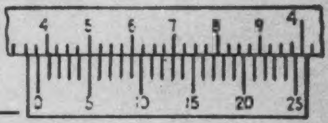
E. ______________


4 5 6 7 8 9 4
0 5 10 15 20 25

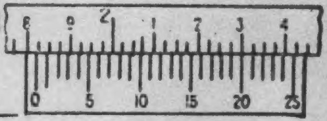
F. ______________


1 2 3 4 5 6 7
0 5 10 15 20 25

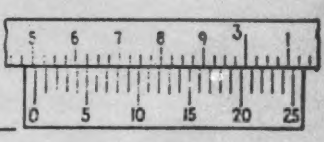
G. ______________


4 5 6 7 8 9 4
0 5 10 15 20 25

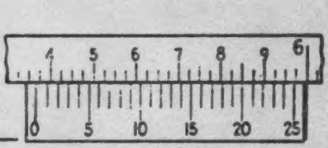
H. ______________


8 9 2 1 2 3 4
0 5 10 15 20 25

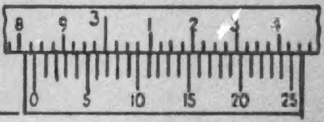
I. ______________


5 6 7 8 9 3 1
0 5 10 15 20 25

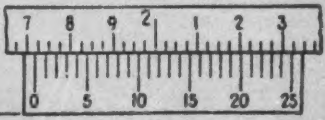
J. ______________


4 5 6 7 8 9 6
0 5 10 15 20 25

K. ______________


8 9 3 1 2 3 4
0 5 10 15 20 25

L. ______________


7 8 9 2 1 2 3
0 5 10 15 20 25

## UNIT IX

## MEASURING AND LAYOUT

### ANSWERS TO ASSIGNMENT SHEETS

Assignment Sheet 1

A. 1. 1/4 inch
2. 1/2 inch
3. 1 1/4 inches
4. 1 3/4 inches
5. 3 inches
6. 3 3/4 inches
7. 4 1/2 inches
8. 6 inches
9. 3 inches
10. 3 3/4 inches

B. 1. 3/8 inch
2. 6/8 or 3/4 inch
3. 1 1/8 inches
4. 1 5/8 inches
5. 2 5/8 inches
6. 3 7/8 inches
7. 4 3/8 inches
8. 4 6/8 or 4 3/4 inches
9. 7/8 inch
10. 32/8 or 4 inches

C. 1. 3/16 inch
2. 7/16 inch
3. 1 1/16 inches
4. 1 8/16 or 1 1/2 inches
5. 2 3/16 inches
6. 2 7/16 inches
7. 2 15/16 inches
8. 3 4/16 or 3 1/4 inches
9. 11/16 inch
10. 4/16 or 1/4 inch

D. 1. 1 inch 3/16 inch
2. 1 inch 15/16 inch
3. 2 inches 9/16 inch
4. 5 inches 3/16 inch
5. 5 inches 1/16 inch
6. 3/4 inch
7. 5/8 inch
8. 4 inches

## Assignment Sheet 2

A. 1. 1 1/2 inches

2. 1 1/2 inches

B. 1. 1 1/2 inches

2. 3 inches

C. 1. 1/2 inch

2. 4 15/16 inches

D. 1. 1 5/8 inches

2. 1 1/8 inches

E. 1. 1 inch

2. 1 1/2 inches

F. 1. 1 5/8 inches

2. 2 inches

## Assignment Sheet 3

Evaluated to the satisfaction of the instructor.

## Assignment Sheet 4

A. 1 foot 1 inch

B. 1 foot 3 inches

C. 9 inches

D. 2 feet 1 inch

E. 1 foot 4 3/4 inches

F. 1 foot 7 7/8 inches

G. 1 foot 9 15/16 inches

H. 5 1/2 inches

I. 2 feet 2 3/4 inches

J. 11 7/8 inches

K. 2 feet 6 15/16 inches

L. 2 feet 10 1/4 inches

M. 10 inches

N. 1 foot 11 3/4 inches

O. 4 feet 1 1/16 inches

P. 6 feet

Q. 8 feet

R. 10 feet

S. 14 feet

T. 4 feet 8 5/16 inches

## Assignment Sheet 5

A. 0.871
B. 0.226
C. 0.184
D. 0.291
E. 0.086
F. 0.023
G. 0.500
H. 0.342
I. 0.047
J. 0.125
K. 0.613
L. 0.250
M. 0.012
N. 0.079
O. 0.282
P. 0.100
Q. 0.133
R. 0.053
S. 0.393
T. 0.375
U. 0.049
V. 0.058
W. 0.483
X. 0.249
Y. 0.102

## Assignment Sheet 6

A. 1.500
B. 3.380
C. 4.340
D. 0.820
E. 3.360
F. 2.505
G. 3.890
H. 5.370
I. 3.375
J. 2.835
K. 0.112
L. 1.723

## UNIT IX

## MEASURING AND LAYOUT

### INFORMATION SHEET 3--LAYOUT

I. Layout equipment

   A. Squares--Includes T-square, steel square, combination square, and try square used to layout angles and lines.

   B. Layout blue (fluid)--Many types of coatings are used to provide a marking surface for layout lines on slick metal.

   C. Dividers--Used to draw circles and squares or mark off equal distances.

   D. Scratch awl or scriber--Used to draw lines.

   E. Center punch--Used to mark points on metal surfaces.

   F. Protractor--Used to measure or layout angles.

   G. V-block--Used to hold round stock for layout.

   H. Angle plate--Used to clamp work in various positions for layout.

   I. Surface gauge--Used to locate heights or dimensions on a baseplate or layout table.

   J. Surface plate--A flat precision surface used as a base for measuring tools and the workpiece during layout.

II. Layout safety

   A. Do not carry scribers, dividers, or other pointed tools in your pocket.

   B. Cover sharp points of tools with a cork or protective cover when they are not being used.

   C. Wear goggles when grinding points on layout tools.

   D. Remove burrs and sharp edges from the workpiece before beginning work.

   E. Seek first aid treatment quickly for any cut, scratch, or bruise, no matter how minor it may appear.

# UNIT IX

## MEASURING AND LAYOUT

## JOB SHEET 1--READ A RULE

I. Tools and materials

A. 6" steel rule

B. 12" steel rule

C. Workpieces

(NOTE: Have 5 to 10 workpieces of various lengths.)

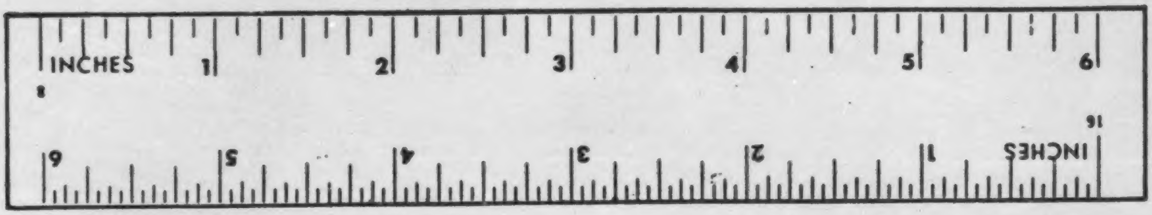
II. Procedure

(NOTE: Rules may vary in length from 1" to 48" and number of graduations per inch but all read the same way.)

A. Select workpieces that are smooth and free of burrs.

B. Determine the number of graduations (divisions) per inch on the 6" rule.

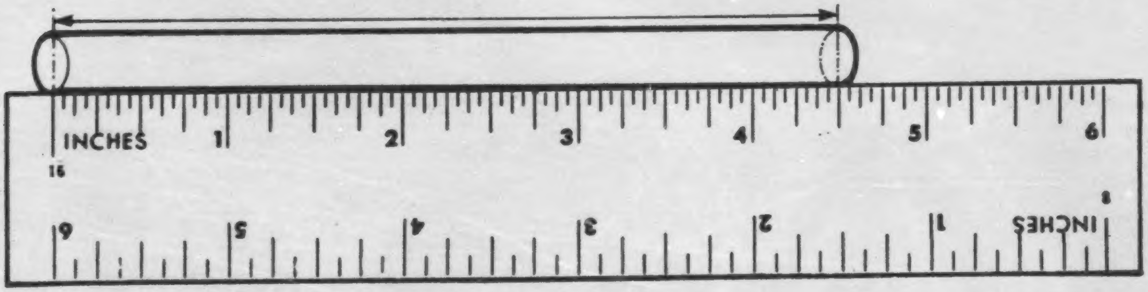
(NOTE: Notice the 8 and 16 numbers indicating the graduations on each side.)



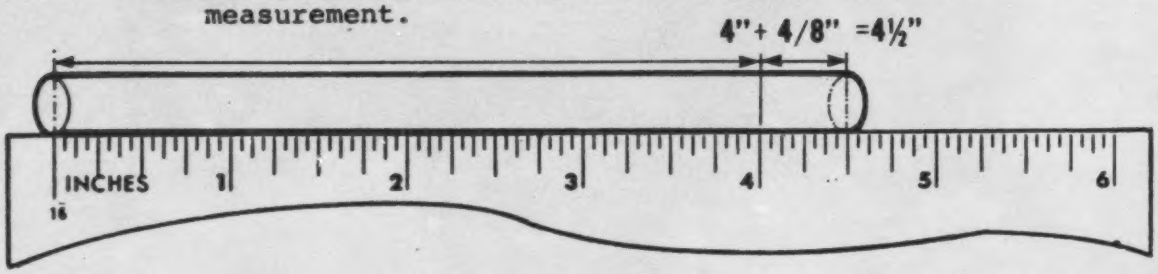
C. Locate the graduation sizes by the length of the marks for 1/16, 1/8, 1/4, 1/2, and whole inches shown above.

D. Measure a workpiece less than 6 inches in length.

1. Place the end of the 6 inch rule even with one end of the workpiece.



2. Count the whole number marks behind the point of measurement.



3. Count the graduations beyond the last whole number mark over to the point of measurement as shown above.

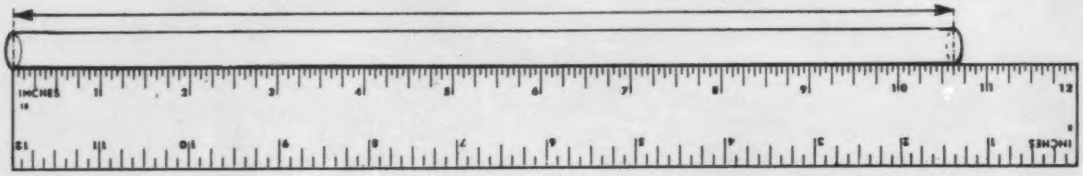
4. Add the amount of whole numbers to the fraction

   Example: 4 whole numbers + 1/2 fraction = 4 1/2 inch

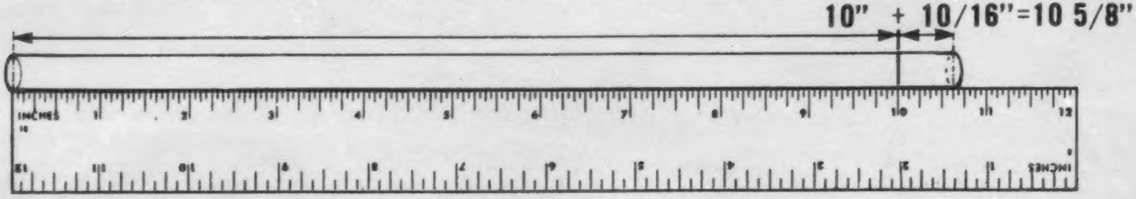
5. Record the measurements of the workpieces.

E. Measure a workpiece longer than 6 inches.

1. Place the end of the 12 inch rule even with the end of the workpiece.



2. Count the whole numbers behind the point of measurement.



3. Count the graduations beyond the last whole number mark over to the point of measurement as shown above.

4. Add the amount of the whole numbers to the fraction.

   Example: 10 whole numbers + 5/8 fraction = 10 5/8

5. Record the measurements of the workpieces.

F. Return the tools to the tool room.

B. Hand in the recorded measurements to the instructor.

## UNIT IX

## MEASURING AND LAYOUT

### JOB SHEET 2--MEASURE WITH SPRING CALIPERS

I. Tools and materials

   A. Inside spring calipers

   B. Outside spring calipers

   C. 6" steel rule

   D. Workpieces

   (NOTE: Have several round workpieces with inside and outside diameters.)

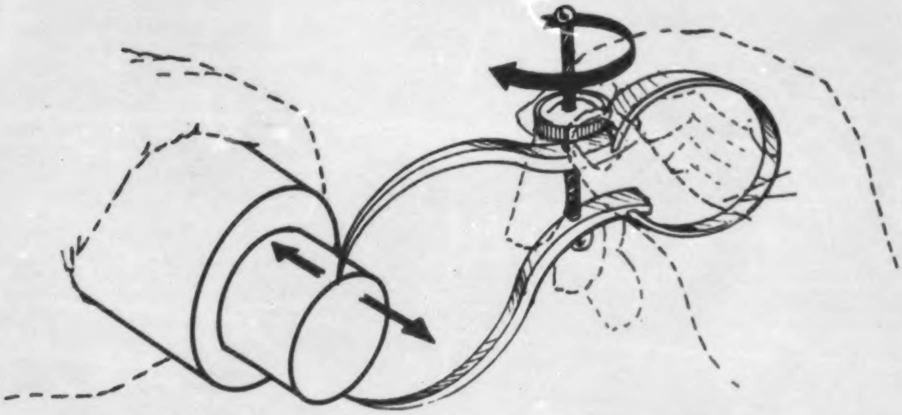
II. Procedure

   A. Outside calipers

      1. Select workpieces that are smooth and free of burrs.

      2. Open the outside caliper wider than the workpiece diameter to be measured.

      (NOTE: Hold the caliper with one hand and the workpiece with the other hand.)



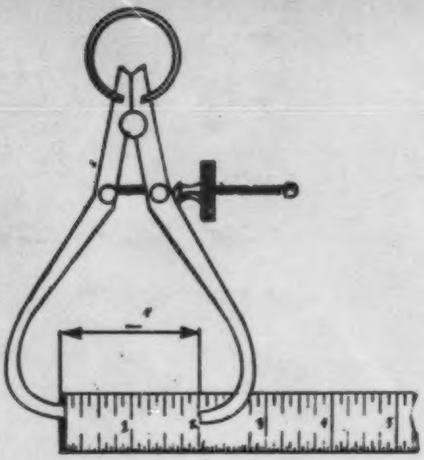
      3. Tighten the adjustment nut with your thumb and forefinger as you move the caliper back and forth across the diameter to be measured.

      4. Tighten the nut until you "feel" a light drag on the caliper tips as it moves across the workpiece.

      (NOTE: Practicing this "feel" is very important to get accurate measurements.)

5. Transfer the dimension to a steel rule.

   (NOTE: Place one hook of the rule on the end of the rule-zero point.)



6. Read the measurement from the 0 (zero) point to the other hook of the caliper.

7. Record the measurement.

B. Inside calipers

1. Select workpieces that are smooth and free of burrs.

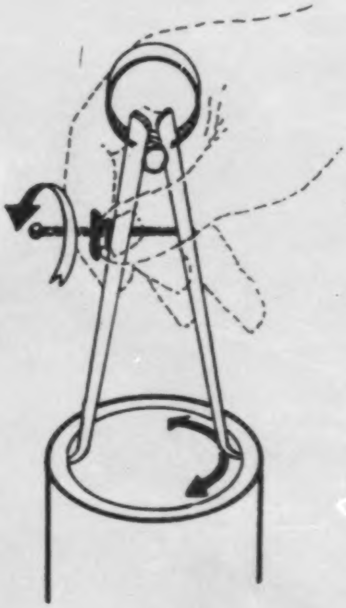
2. Close the inside caliper so that it is smaller than the hole to be measured.

   (NOTE: Hold the caliper with one hand and the workpiece with the other hand.)

3. Loosen the adjustment nut with your thumb and forefinger as you swing one leg of the caliper back and forth in the hole.

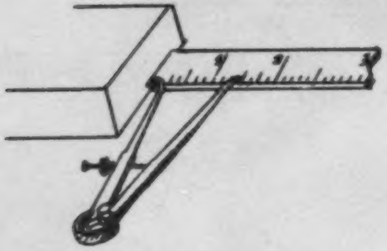
4. Loosen the nut until you "feel" a light drag as the tip moves back and forth.

   (NOTE: Practicing this "feel" is important to get accurate measurement.)



5. Transfer the measurement to a steel rule.

   (NOTE: Place one end of the rule and caliper against a square edge to get proper alignment.)



6. Read the measurement from the 0 (zero) point to the other hook on the caliper.

7. Record the measurement.

C. Return the tools to the tool room.

D. Hand in the recorded measurements to the instructor.

## UNIT IX

## MEASURING AND LAYOUT

### JOB SHEET 3--MEASURE WITH A MICROMETER

I. Tools and materials

  A. Micrometers, plain

    1. 0 - 1 inch size

    2. 1 - 2 inch size

  B. Vise

  C. Workpieces

    1. New fractional drill bits, assortment of 5

    2. New letter size drill bits, assortment of 5

    3. Pieces of metal such as cold rolled stock, machined parts, hardened dowels--at least 5

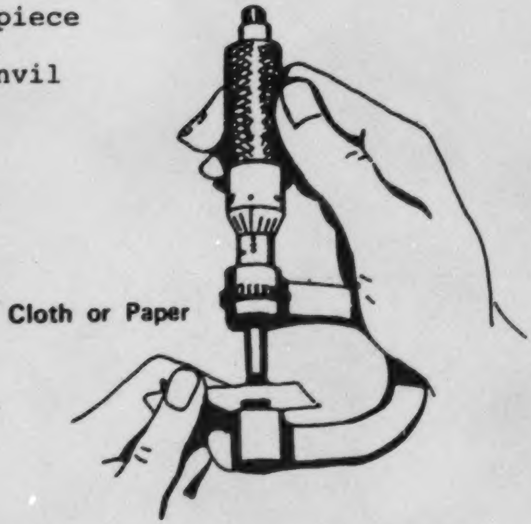
    (NOTE: All workpieces should be numbered or lettered to keep them in order.)

II. Procedure

  A. Select workpieces that are clean and free of burrs, nicks, or dents

  B. Select the proper size micrometer for the workpiece

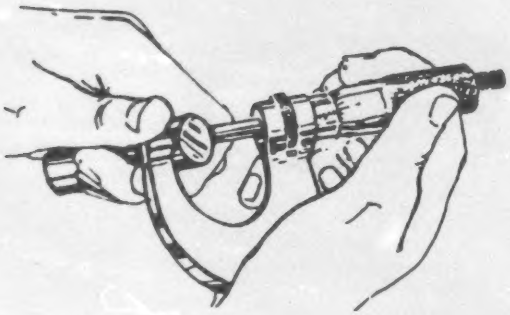
  C. Clean the spindle and anvil of the micrometer



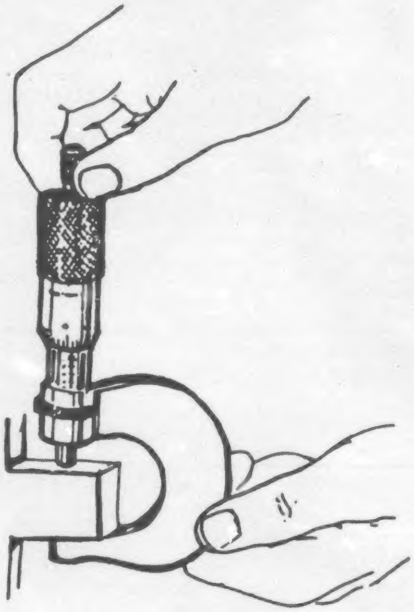
D. Check the micrometer for proper alignment.

1. Close the micrometer to the zero point.
2. If the micrometer is not on zero, ask the instructor to adjust it.

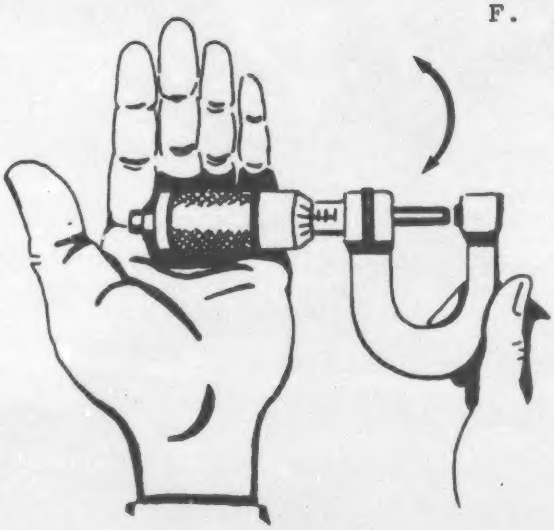
E. Hold the micrometer correctly for the type of workpiece.



1. For a loose workpiece--Hold the micrometer in the right hand and the workpiece in the left hand to measure a loose object.



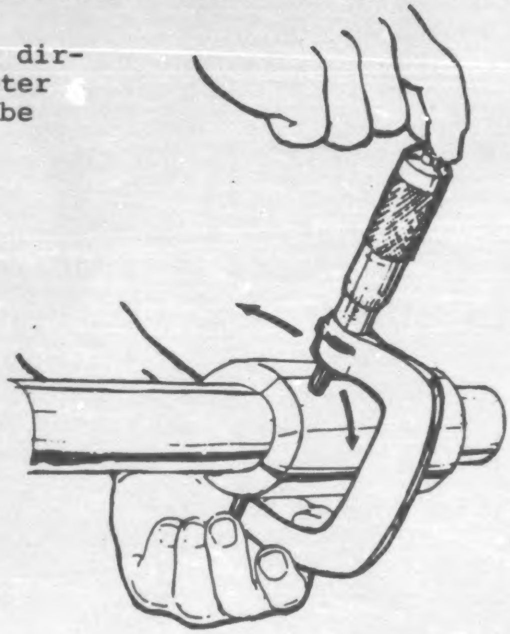
2. For a fixed workpiece--Hold the micrometer in both hands to measure a fixed object.



F. Roll micrometer along palm of hand or forearm for rapid thimble movement.

(NOTE: Do not twirl the micrometer with one hand.)

G. Place the micrometer directly around the center of the workpiece to be measured.



H. Turn the thimble of the micrometer until the anvil and spindle touch the workpiece.

I. Hold the anvil steady and move the spindle lightly over the workpiece to locate the true centerline.

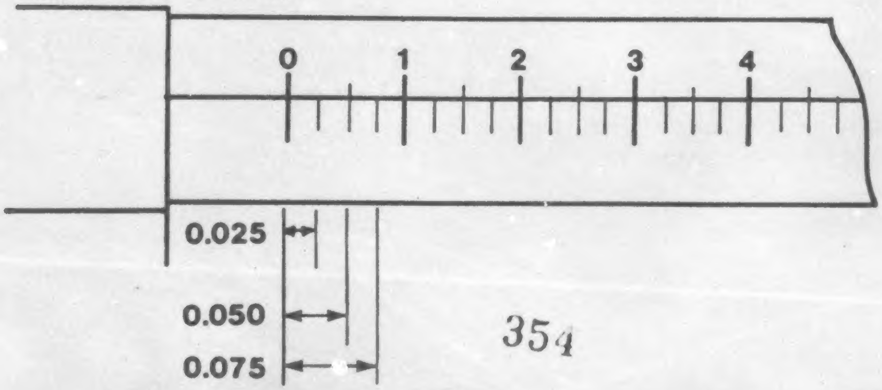
J. Use the ratchet stop or light sense of "feel" to get exact measurement.

K. Check the micrometer reading.

(NOTE: The spindle lock can be set to hold measurement if the micrometer must be removed from workpiece. The spindle, lock must be released before turning the thimble.)

1. Each numbered graduation on the sleeve represents one hundred-thousandths of an inch. (.100)

2. Each small graduation on the sleeve between the numbered marks represents twenty-five thousandths of an inch. (.025)



3. Each graduation on the thimble represents one thousandths of an inch.

4. Total amount is found by adding the three values.

Example: .100 number on sleeve
.075 small graduation on sleeve
.015 graduation on thimble
.190 total amount

L. List the readings for each workpiece according to the letter or number on the workpiece.

M. Return the micrometer to its correct storage in the tool room.

(NOTE: The spindle and anvil of the micrometer should be left open when stored.)

N. Hand in the listed readings to the instructor for evaluation.

# UNIT IX

# MEASURING AND LAYOUT

## JOB SHEET 4--MEASURE WITH A VERNIER CALIPER

I. Tools and materials

   A. Vernier caliper

   B. Workpieces

      1. Assortment of fractional drill bits

      2. Assortment of letter size drill bits

      3. Assortment of machined parts

         (NOTE: All workpieces should be numbered or lettered for identification.)

II. Procedure

   A. Select workpieces that are smooth and free of burrs, nicks, or dents

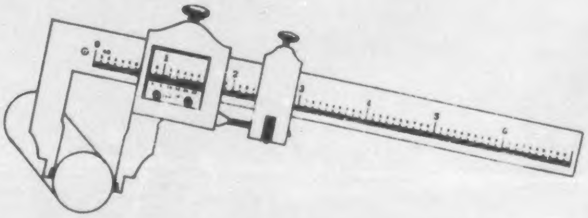
   B. Clean inside faces of caliper jaws

   C. Check vernier caliper at zero reference

      (NOTE: If the caliper is not on zero when closed, ask the instructor to adjust it.)

   D. Open caliper more than the thickness of the part to be measured.

   E. Hook the end jaw over the part to be measured.



   F. Slide the movable jaw into contact with the part.

   G. Tighten the clamp screw on the fine adjustment nut.

   H. Make fine adjustment with the fine adjusting screw if necessary.

I. Tighten the clamping screw above the vernier plate.

J. Remove the caliper from work carefully.

K. Read the caliper.

L. List the reading according to the letter or number on the workpiece.

M. Return the vernier caliper to the correct storage place in the tool room.

N. Hand in the listed readings to instructor for evaluation.

## UNIT IX

## MEASURING AND LAYOUT

### JOB SHEET 5--USE A DIAL INDICATOR

I. Tools and materials

   A. Dial indicator

   B. Dial indicator holder

   C. Magnetic base

   D. V blocks - 2

   E. An assortment of machined parts

      (NOTE: All workpieces should be numbered or lettered in order to be checked with the indicator.)

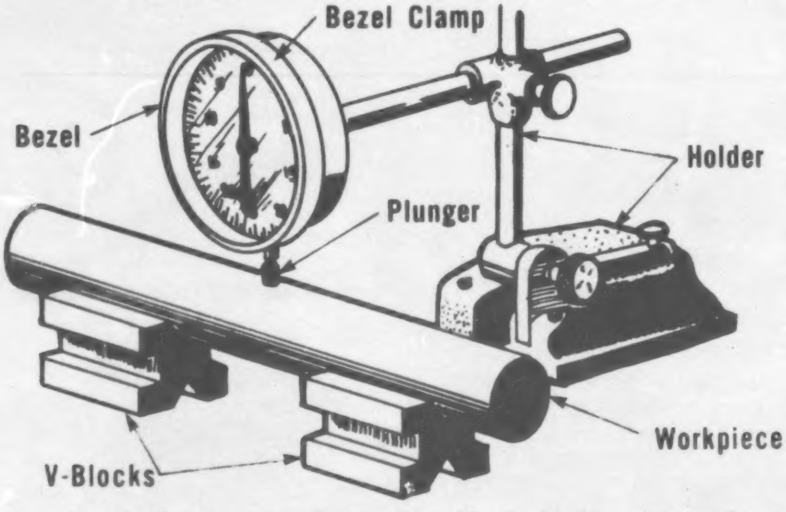
II. Procedure

   A. Select workpieces that are clean and free of burns, nicks, or dents.

   B. Attach the dial indicator to the holder.

   C. Place the holder on the work surface.

   D. Place the workpiece so that the measurement can be made.



   E. Place the holder so that the dial indicator plunger contacts the workpiece.

   F. Adjust the holder so that the plunger is pushed up about two turns of the pointer and then tighten the holder.

G. Turn the bezel until the zero marking is in line with pointer.

H. Move the plunger along the workpiece to measure the workpiece for taper, and run-out.

I. Turn the workpiece to check the workpiece for roundness.

J. List the readings according to the letter or number on the workpiece.

K. Remove the dial indicator from the holder and return to the correct storage in the tool room.

L. Hand in the listed readings to the instructor for evaluation.

## UNIT IX

## MEASURING AND LAYOUT

### TEST--PART 1

1. Match the terms to the correct definition by writing each of the numbers on the right in the correct blanks on the left.

____ a. Mistake in the reading or total measurement.

____ b. Starting point of measurement for both the workpiece and steel rule.

____ c. Accurate measurement

____ d. Low precision measuring instrument graduated in fractional or decimal parts of an inch.

____ e. Marks found on a rule to show unit of length.

1. Steel rule
2. Error
3. Graduations
4. Reference point
5. Reliable measure

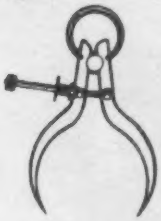
2. Identify the semi-precision tools used in the shop by writing each name listed below in the correct blank.

Steel square

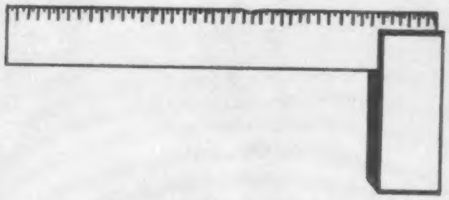
Tape measure

Spring calipers

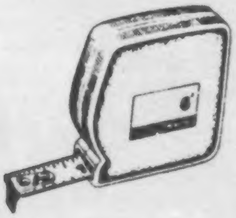
Steel rule



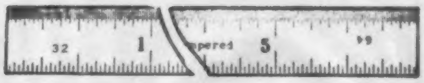
a. ____________________



b. ____________________



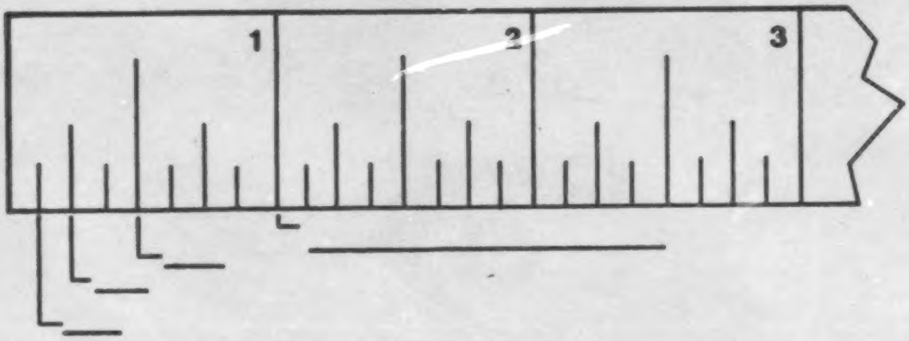
c. ____________________



d. ____________________

3. Explain how to read a rule by answering the following questions:

(a) What are the graduation marks on the rule shown below.



(b) Number the steps listed below in the correct order (1-4) for reading a rule.

____ (1) Reduce any improper fraction in the total to the simplest form.

____ (2) Check the size of the graduations on the rule.

____ (3) Add any fraction of an inch to the number of inches behind the point of measurement.

____ (4) Count the number of divisions from the last inch mark to the point of measurement.

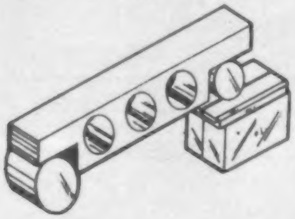
## UNIT IX

## MEASURING AND LAYOUT

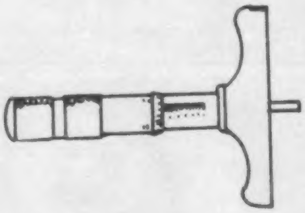
### TEST--PART 2

1. Identify the precision measuring tools used in the shop by writing the name of each below in the correct blank.

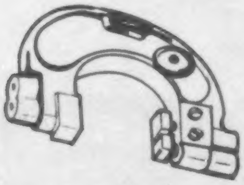
Inside micrometers
Outside micrometers
Depth micrometers
Screw thread micrometers
Vernier calipers
Vernier height gauge
Ring gauge
Thread plug and ring gauge
Screw pitch gauge
Gauge blocks
Dial indicator
Telescoping gauge
Parallel bars
Plug gauge
Go and no-go gauge
Snap gauge
Radius and fillet gauge
Sine bar



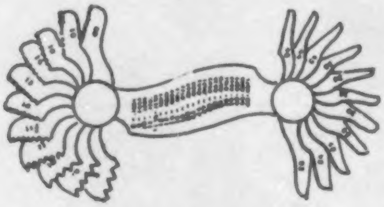
a. ______________________



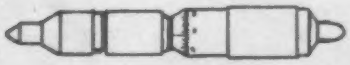
d. ______________________



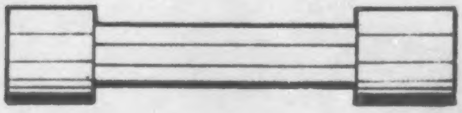
b. ______________________



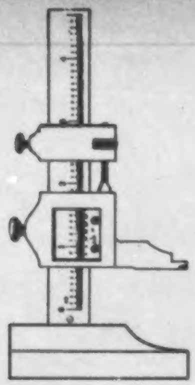
e. ______________________



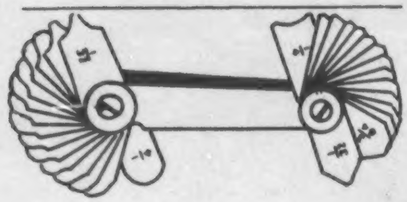
c. ______________________



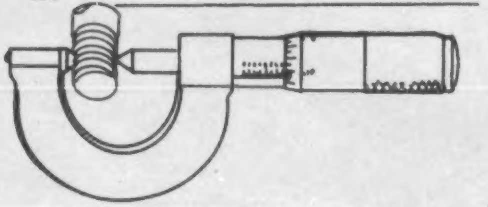
f. ______________________



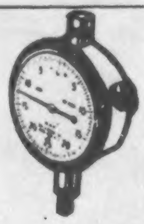
g. ____________________



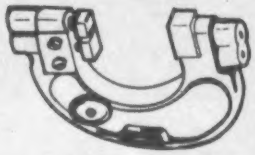
h. ____________________



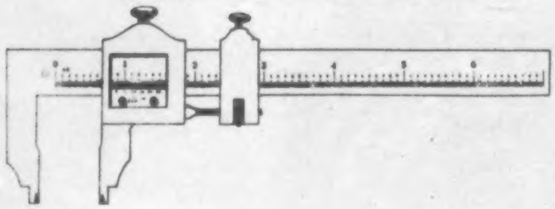
i. ____________________



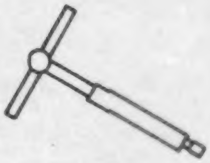
j. ____________________



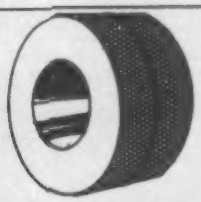
k. ____________________



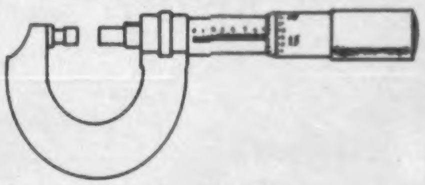
l. ____________________



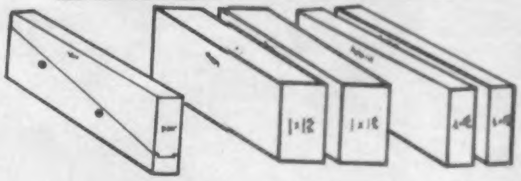
m. ____________________



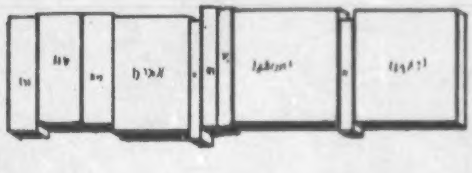
n. ____________________



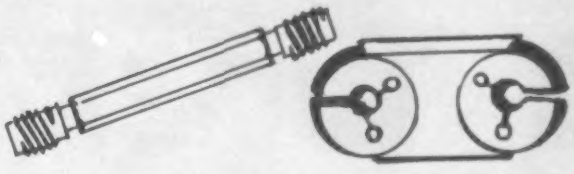
o. ____________________



p. ____________________



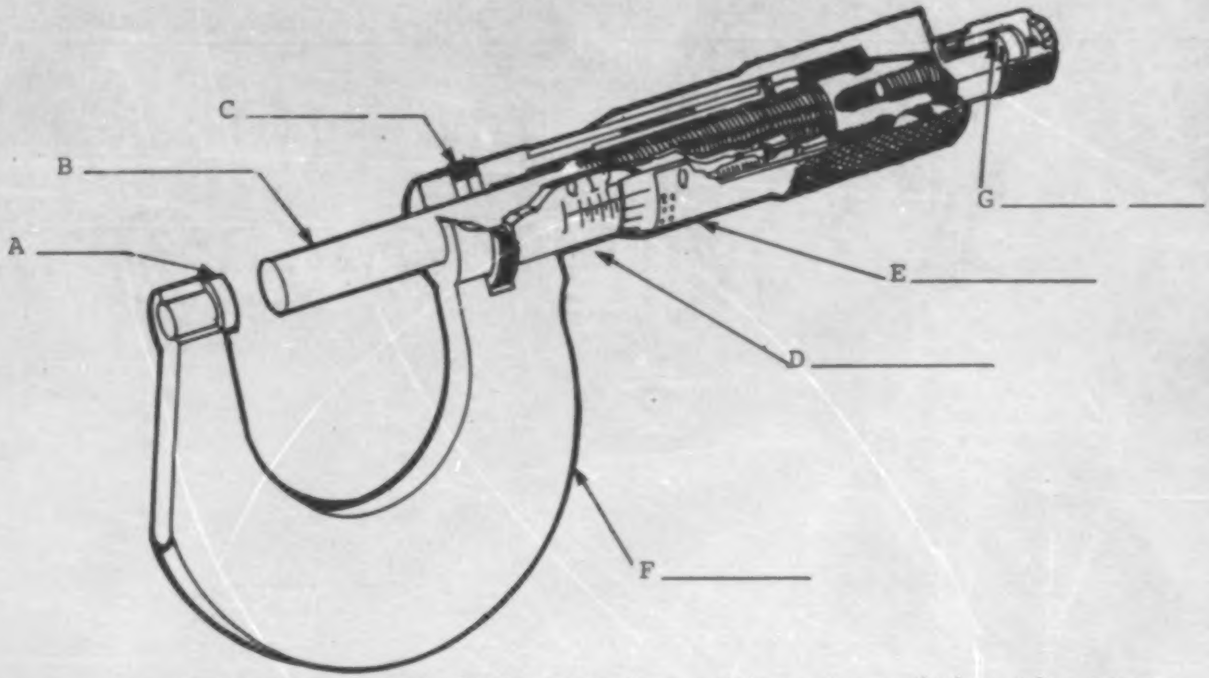
q. ____________________



r. ____________________

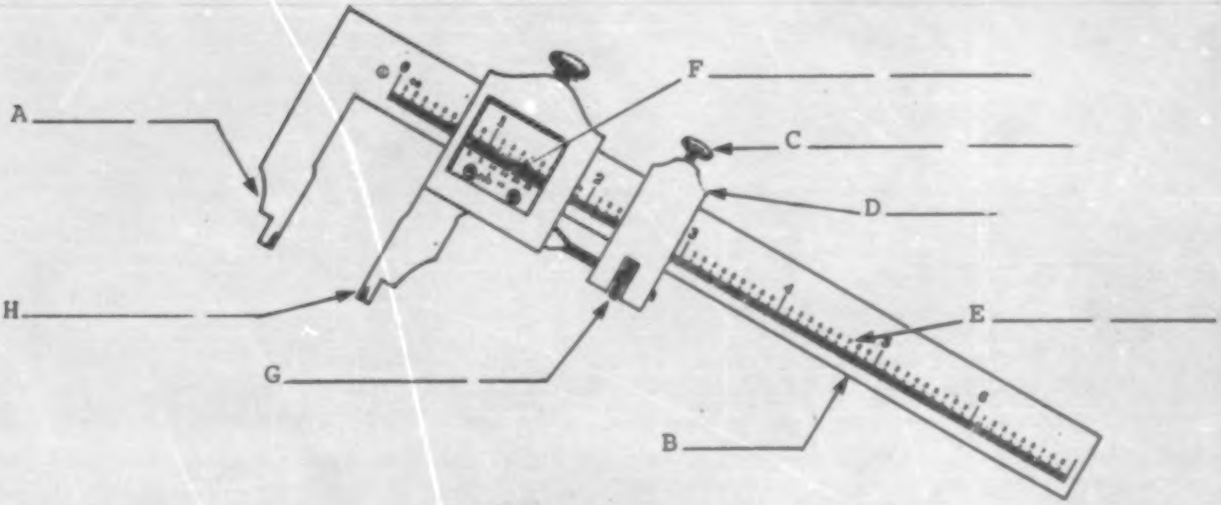
2. Name the parts of an outside micrometer by writing the name of each below in the correct blank.

Anvil
Frame
Lock nut
Ratchet stop
Sleeve
Spindle
Thimble



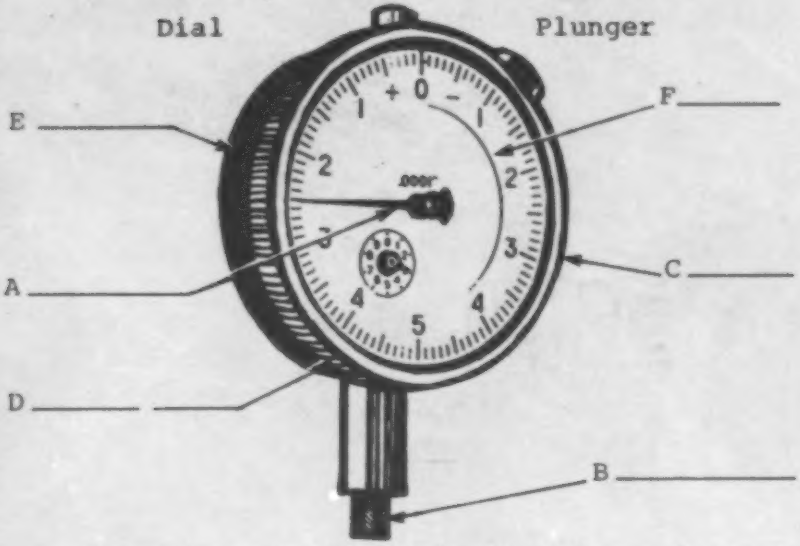
3. Name the parts of the vernier caliper by writing the name of each below in the correct blank.

Fixed jaw
Movable jaw
Beam
Clamp
Clamp screw
Main scale
Vernier scale
Adjusting nut



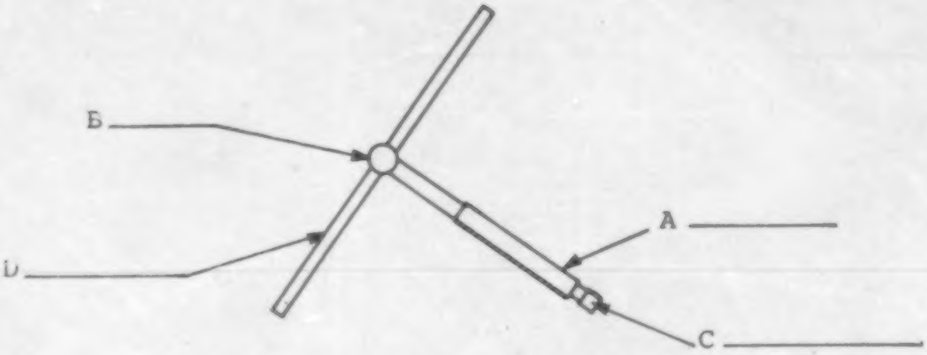
4. Name the parts of the dial indicator by writing each name below in the correct blank.

Housing
Dial
Pointer
Plunger
Bezel
Bezel clamp



5. Name the parts of the telescoping gauge by writing the name of each in the correct blank below.

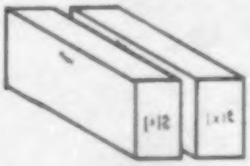
Handle
Plunger
Head
Thumbscrew

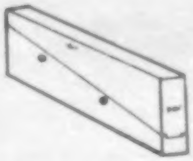


6. Identify the two types of parallel bars by writing the name of each in the correct blank.

Adjustable

Non-adjustable





a. ______________ b. ______________

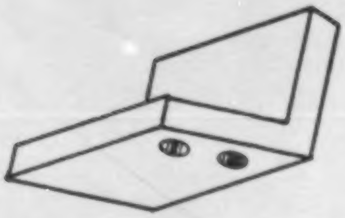
# UNIT IX

# MEASURING AND LAYOUT

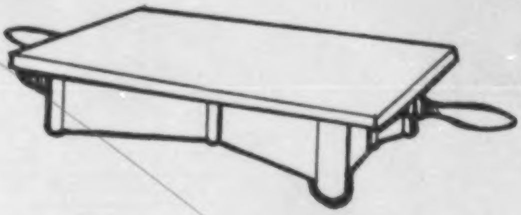
## TEST--PART 3

1. Identify the equipment in the shop used for layout by writing the name of each below in the correct blank.

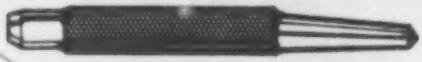
Center punch
Layout blue
Scratch awl
Surface gauge
V-block
Combination square
Dividers
Surface plate
Protractor
Angle plate



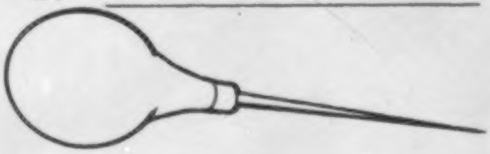
a. ____________________



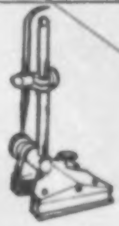
b. ____________________



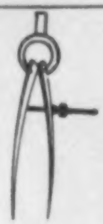
c. ____________________



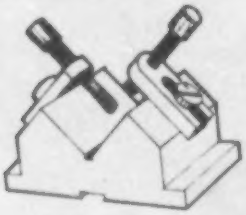
d. ____________________



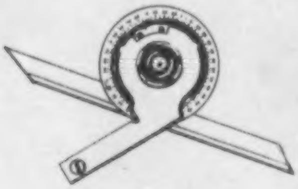
e. ____________________



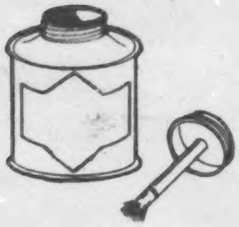
f. ____________________

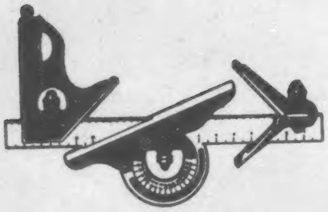


g. ____________________



h. ____________________





i. ____________________ j. ____________________

2. Select the proper safety rules to follow during layout procedures by placing a "√" in front of the correct safety rules below.

   ____ a. Wear goggles when grinding points on layout tools.

   ____ b. Carry scribers, dividers, and other sharp pointed tools in your pocket out of the way.

   ____ c. Remove burrs and sharp edges from the workpiece before beginning work.

   ____ d. Get prompt medical attention for any cut, scratch, or bruise no matter how minor it may appear.

   ____ e. Do not cover sharp points of tools with anything so others can see the dangerous points.

# UNIT IX

# MEASURING AND LAYOUT

## ANSWERS TO THE TEST

### Part 1

1. a. 2
   b. 4
   c. 5
   d. 1
   e. 3
2. a. Spring calipers
   b. Steel square
   c. Tape measure
   d. Steel rule
3. a. (1) whole inch
      (2) 1/2 inch
      (3) 1/4 inch
      (4) 1/8 inch
   b. (1) 4
      (2) 1
      (3) 3
      (4) 2

## Part 2

1. a. Sine bar
   b. Snap gauge
   c. Inside micrometer
   d. Depth micrometer
   e. Screw pitch gauge
   f. Plug gauge
   g. Vernier height gauge
   h. Radius and fillet gauge
   i. Screw thread micrometers
   j. Dial indicator
   k. Go and no-go gauge
   l. Vernier calipers
   m. Telescoping gauges
   n. Ring gauge
   o. Outside micrometers
   p. Parallel bar
   q. Gauge blocks
   r. Thread plug and ring gauge
2. a. Anvil
   b. Spindle
   c. Locknut
   d. Sleeve
   e. Thimble
   f. Frame
   g. Ratchet stop
3. a. Fixed jaw
   b. Beam
   c. Clamp screw
   d. Clamp
   e. Main scale
   f. Vernier scale
   g. Adjusting nut
   h. Movable jaw
4. a. Pointer
   b. Plunger
   c. Bezel
   d. Bezel clamp
   e. Housing
   f. Dial
5. a. Handle
   b. Head
   c. Plunger
   d. Thumbscrew
6. a. Non-adjustable
   b. Adjustable

## Part 3

1. a. Angle plate
   b. Surface plate
   c. Center punch
   d. Scratch awl
   e. Surface gauge
   f. Dividers
   g. V-block
   h. Protractor
   i. Layout blue
   j. Combination square

2. a. ✓
   b.
   c. ✓
   d. ✓
   e.

# UNIT X

## READING DRAWINGS AND BLUEPRINTS

### UNIT OBJECTIVE

After completion of this unit, the student will be able to explain the purpose of a drawing or blueprint. The student will also be able to identify the various terms, lines, and types of drawings used on blueprints. This knowledge will be evidenced through demonstration and by satisfactorily completing a unit test.

### SPECIFIC OBJECTIVES

After completion of this unit, the student will be able to:

1. Explain the purpose of a drawing or blueprint.
2. Identify the three basic views of a drawing.
3. Match the terms associated with drawings to the correct definition.
4. Identify the types of drawings used on blueprints.
5. Identify the types of lines used on blueprints.
6. Name the three types of scales used in drawing.

# UNIT X

# READING DRAWINGS AND BLUEPRINTS

## SUGGESTED TEACHING ACTIVIITES

I. Objective sheet

   A. Discuss the unit objective with the students.

   B. Discuss each specific objective with the students.

   C. Have the students complete the objectives in the most logical sequence for shop organization.

II. Information sheet

   A. Explain the use of drawings and blueprints in the shop.

   B. Show examples of typical project blueprints made in the shop.

   C. Show examples of different types of drawings used in blueprinting.

   D. Explain the use of drafting equipment in the shop.

III. Transparencies

   A. TM-1--BASIC VIEWS OF A DRAWING

   B. TM-2--TYPES OF DRAWINGS

   C. TM-3--TYPES OF LINES ON A BLUEPRINT

   D. TM-4--DRAFTING SYMBOLS

   E. TM-5--DIMENSIONS

IV. Assignment Sheets

   A. ASSIGNMENT SHEET 1--APPLY THE USE OF LINES

      1. Show examples of the use of lines in various blueprints.

      2. Have students draw a blueprint using several of the types of lines.

   B. ASSIGNMENT SHEET 2--MEASURING OBJECTS

      1. Provide 6-inch rules for each student.

      2. Have students draw several other drawings and give dimensions.

C. ASSIGNMENT SHEET 3--DRAWING OBJECTS

1. Provide a 6-inch rule for each student.

2. Have students draw a project of their choice.

V. Answers to assignments

A. Answers should be kept within an acceptable tolerance for the students ability.

B. Add answer sheets for additional assignment sheets included.

VI. Test

A. The test is based on total information covered on the information sheet.

B. Various approaches may be used in testing.

1. Give the entire test after the student has completed studying the information on the information sheet.

2. Give one portion of the test as an additional assignment or to reinforce problem areas of learning.

C. Include test parts corresponding to any information area or sheets added to the unit.

VII. Answers to the test.

A. Answers are based on total information covered in the unit.

B. For convenience of grading, make corresponding answer sheets for any additional test parts included.

VIII. References

A. Kibbe, Richard R. Machine Tool Practices. John Wiley and Sons, Inc. New York.

B. French and Vierck. Engineering Drawing. McGraw-Hill Book Company. New York.

C. Walker, John R. Modern Metalworking. The Goodheart-Wilcox Co. South Holland, Illinois. 1970.

# UNIT X

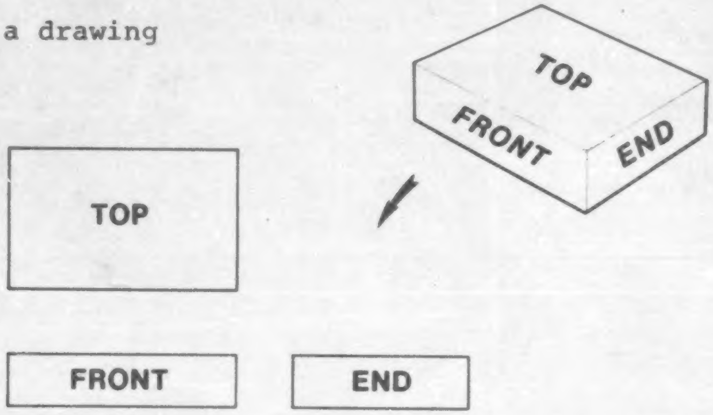
## READING DRAWINGS AND BLUEPRINTS

### INFORMATION SHEET

I. Purpose of a drawing or blueprint--To convey a message from the designer to the workers by showing the shape and size of parts and how they fit together.

II. Basic views of a drawing

- A. Top
- B. Front
- C. End



III. Terms and definitions

- A. Dimension--Measurements showing the size and location of the part to be machined. (TRANSPARENCY 5)
- B. Scale--Numbers that show whether the part is drawn to full size, enlarged, or reduced on the blueprint.
- C. Specifications--Written instructions on the blueprint for the type of material, tolerences, and finish required on the part.
- D. Symbols--Various identification marks that are placed on blueprints to save time and convey a message to the machinest or welder. (TRANSPARENCY 4)
- E. Sketch--A drawing made by the machinest to show details of a part.
- F. Tolerances--The limits of measurement that the part made by a machinest must be within when complete.

IV. Types of drawings

- A. Pictorial drawings
  - 1. Perspective drawing--Shows an object as it would appear to the eye.

2. Isometric drawing--Shows three faces or sides of a part.

3. Oblique drawing--Shows curved or circular features of a part.

B. Working drawings

1. Assembly drawing--Shows how two or more parts fit together.

2. Detail drawing--Show exact dimensions and specifications on how a part is to be made.

V. Types of lines used on blueprints

A. Object line--Shows the outline of the part.

B. Hidden line--Shows an edge or surface that cannot be seen from the outside of the object.

C. Extension line--Extends the object lines so they may be dimensioned.

D. Dimension line--Points out the area a dimension or measurement is describing.

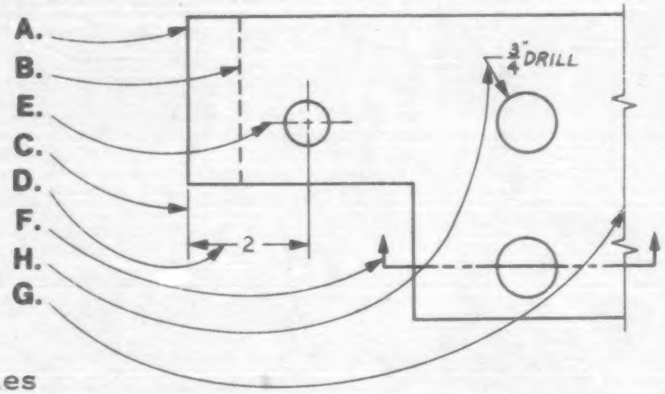
E. Center line--Shows the center of a circle or radius.

F. Cutting plane line--Shows where an object has been cut away to show interior details.

G. Break line--Shows where a part has been shortened during drawing.

H. Leader line--Used to point out a detail described by a dimension or note.

EXAMPLES:



VI. Types of scales

A. Architect's scales

(NOTE: This scale is used some for Mechanical Engineer's drawings.)

| | Scale | Drawing size (as compared to actual part size) |
|---|---|---|
| 1. | 12" = 1' | full |
| 2. | 6" = 1' | 1/2 |
| 3. | 3" = 1' | 1/4 |
| 4. | 1 1/2" = 1' | 1/8 |
| 5. | 1" = 1' | 1/12 |
| 6. | 3/4" = 1' | 1/16 |
| 7. | 1/2" = 1' | 1/24 |
| 8. | 3/8" = 1' | 1/32 |
| 9. | 1/4" = 1' | 1/48 |
| 10. | 3/16" = 1' | 1/64 |
| 11. | 1/8" = 1' | 1/96 |
| 12. | 3/32" = 1' | 1/128 |

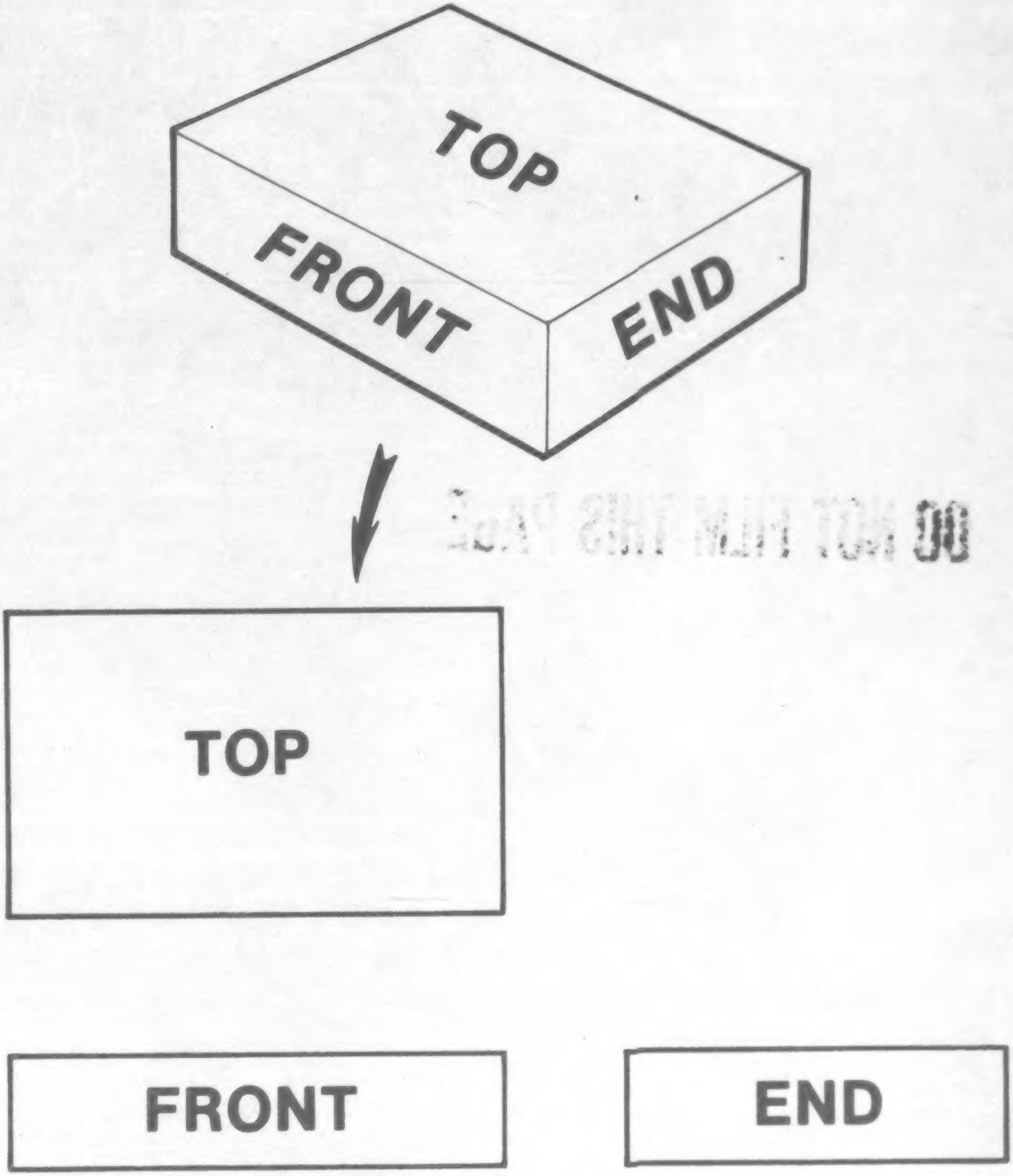
B. Mechanical engineer's scales

| | Scale | Drawing size (as compared to actual part size) |
|---|---|---|
| 1. | 1" = 1" | full |
| 2. | 1/2" = 1" | 1/2 |
| 3. | 1/4" = 1" | 1/4 |
| 4. | 1/8" = 1" | 1/8 |

C. Civil engineer's scales

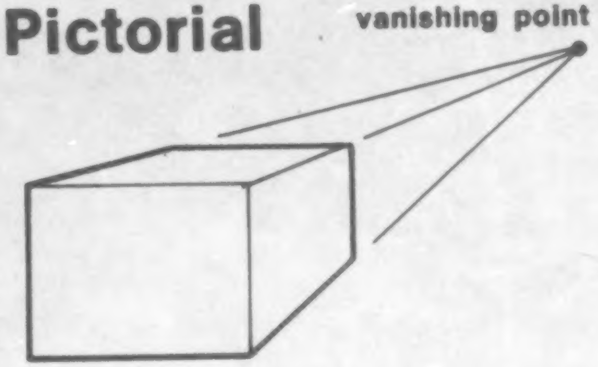
(NOTE: Scales have divisions of the inch in multiples of ten which can stand for single or multiple units such as feet, miles, or rods.)

# BASIC VIEWS OF A DRAWING

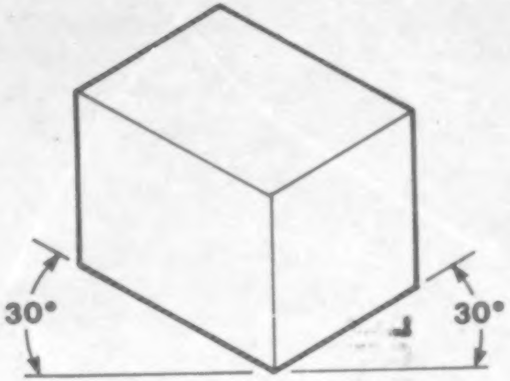

TOP
FRONT
END
TOP
FRONT
END

# TYPES OF DRAWINGS

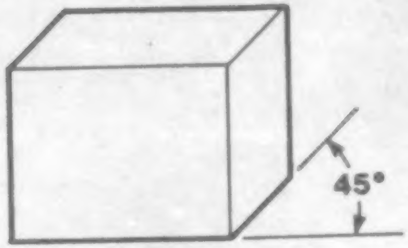
## Pictorial


vanishing point

PERSPECTIVE

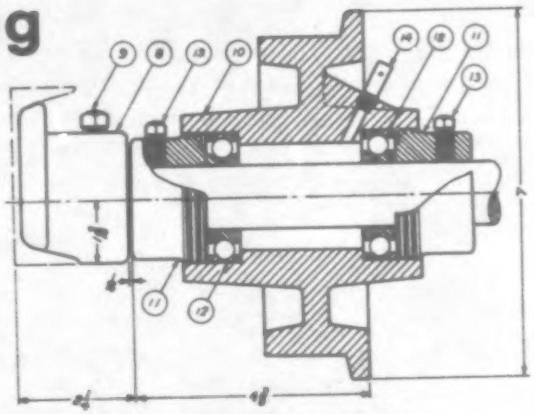


ISOMETRIC

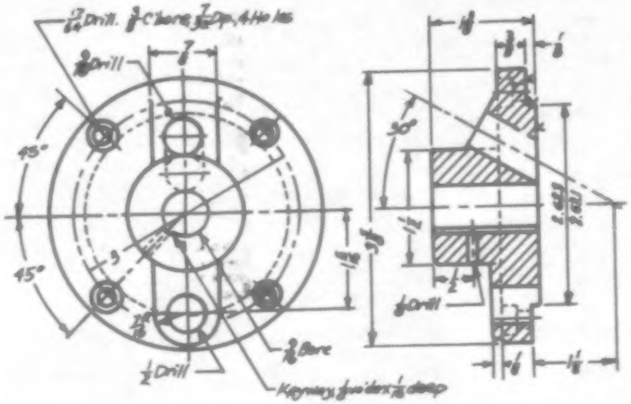


OBLIQUE

## Working

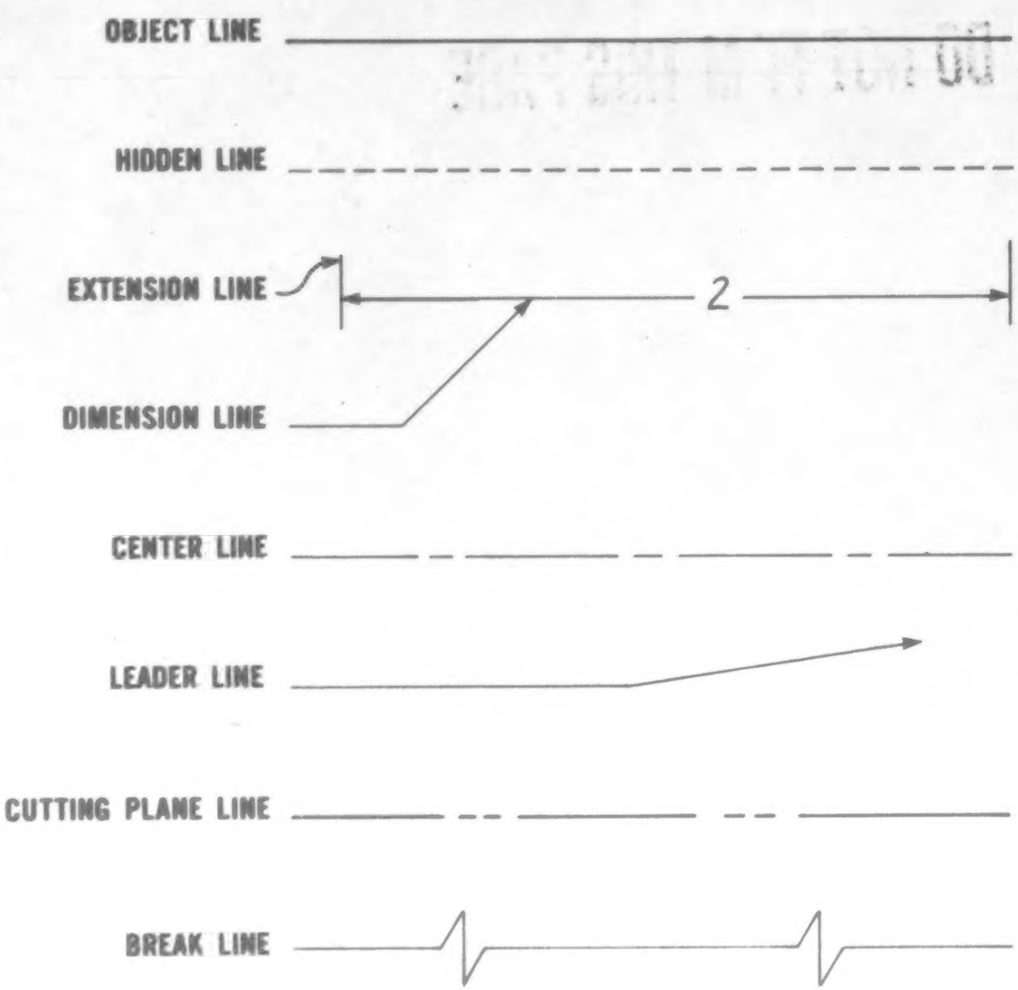


ASSEMBLY


45°
45°
30°
½ Drill

DETAIL

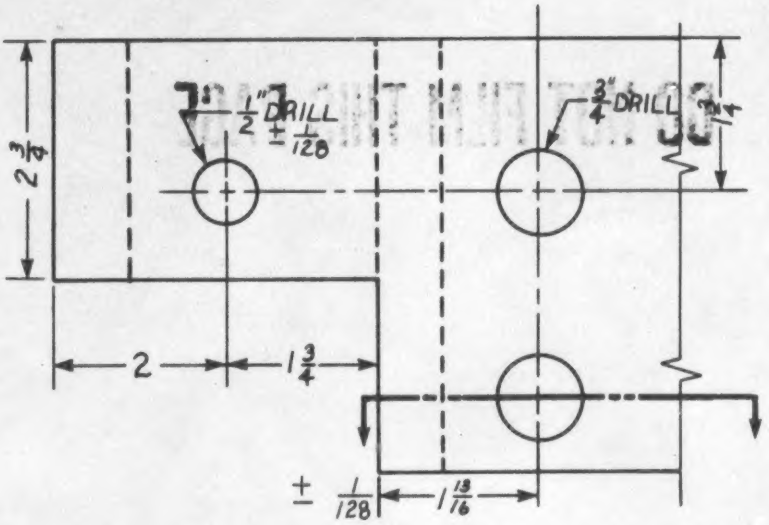
# TYPES OF LINES ON A BLUEPRINT


OBJECT LINE
HIDDEN LINE
EXTENSION LINE
2
DIMENSION LINE
CENTER LINE
LEADER LINE
CUTTING PLANE LINE
BREAK LINE

# DRAFTING SYMBOLS

| SYMBOL | MEANING | SYMBOL | MEANING |
|---|---|---|---|
| ' | Feet, or minutes | THDS. | Threads |
| " | Inches, or seconds | NC | National Coarse |
| ° | Degrees | NF | National fine |
| ± | Plus or minus, more or less | CI | Cast iron |
| CL | Center Line | MS | Machine Steel |
| DIA | Diameter | CS | Carbon steel |
| R | Radius | CRS | Cold-Rolled steel |
| TPI | Teeth per inch | HSS | High-Speed steel |
| P | Pitch | TS | Tool steel |
| RPM | Revolutions per minute | FIN | Finish |
| RH | Right hand | GRD | Grind |
| LH | Left hand | CSK | Countersink |
| USG | United States Gauge | CBORE | Counterbore |
| USS | United States Standard | HDN | Harden |
| SAE | Society of Automotive Engineers | HT TR | Heat Treat |

# DIMENSIONS


1/2" DRILL ± 1/128
3/4" DRILL
2 3/4
2
1 3/4
± 1/128
1 13/16

# UNIT X

# READING DRAWINGS AND BLUEPRINTS

## ASSIGNMENT SHEET 1--APPLY THE USE OF LINES

Directions: Complete each of the following questions concerning the use of lines.

A. Using a straightedge, draw examples of the following lines:

1. Object line

2. Hidden line

3. Dimension line

4. Center line

5. Extension line

B. Identify the use of each type of line by writing each listed below in the correct blank.

Object
Hidden
Extension
Dimension
Center
Cutting plane
Break
Leader

__________ 1. Shows where an object has been cut away to show interior details.

__________ 2. Shows where an object has been shortened during drawing.

__________ 3. Extends the object lines so they may be dimensioned.

__________ 4. Shows the outline of the past.

__________ 5. Shows the center of a circle or radius.

__________ 6. Use to point out a detail described by a dimension or note.

__________ 7. Points out the area a dimension or measurement is used.

__________ 8. Shows an edge or surface that cannot be seen from the outside of the object.

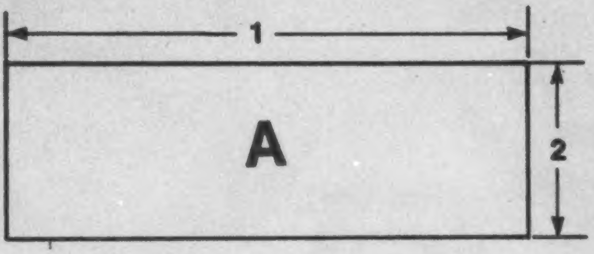
## READING DRAWINGS AND BLUEPRINTS

## ASSIGNMENT SHEET 2--MEASURING OBJECTS

Directions: Using a rule with one-sixteenth inch graduations, measure the following objects.

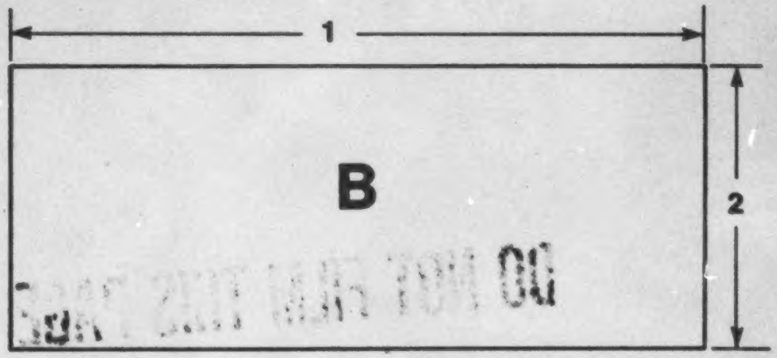
A. 1. Length ____________

2. Height ____________



B. 1. Length ____________

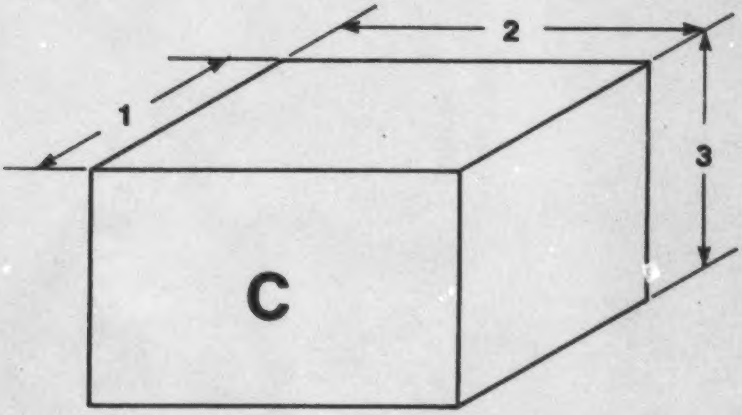
2. Height ____________



C. 1. Width ____________

2. Length ____________

3. Height ____________

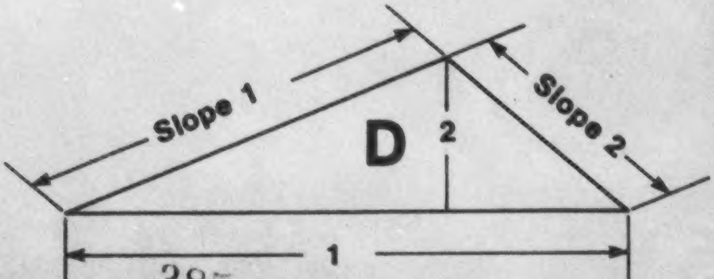


D. 1. Base ____________

2. Height ____________

3. Slope 1 ____________

4. Slope 2 ____________



# UNIT X

# READING DRAWINGS AND BLUEPRINTS

## ASSIGNMENT SHEET 3--DRAWING OBJECTS

Directions: Using a rule with one-sixteenth inch graduations, draw the following lines and objects to the given dimensions.

A. Draw straight lines to the following lengths:

1. 1 3/4 inches
2. 2 3/16 inches
3. 2 7/8 inches
4. 3 1/8 inches
5. 5/4 inches

B. Draw a rectangle with a height of one and three-eighths inches and a length of three one-sixteenth inches.

C. Draw a triangle with a base of two and five-eighths inches, a height of one and three-eighths inches, and one slope of two and three-sixteenths inches.

D. Draw a perspective drawing of a small object in your shop.

E. Draw an oblique drawing of a part in your shop.

F. Draw a detailed drawing of a small part in your shop.

# UNIT X

## READING DRAWINGS AND BLUEPRINTS

## ANSWERS TO ASSIGNMENT SHEETS

### Assignment Sheet 1

A. Drawings should be of each of the following:
   1. Object line
   2. Hidden line
   3. Dimension line
   4. Center line
   5. Extension line

B. 1. Cutting plane
   2. Break
   3. Extension
   4. Object
   5. Center
   6. Leader
   7. Dimension
   8. Hidden

### Assignment Sheet 2

A. 1. 3 inches
   2. 1 inch

B. 1. 4 inches
   2. 1 5/8 inches

C. 1. 1 1/4 inches
   2. 2 1/8 inches
   3. 1 3/8 inches

D. 1. 3 1/4 inches
   2. 7/8 inch
   3. 2 3/8 inches
   4. 1 3/8 inches

Assignment Sheet 3

A. Drawings of lines should be the following lenths:

1. 1 3/4 inches
2. 2 3/16 inches
3. 2 7/8 inches
4. 3 1/8 inches
5. 5/4 inches

B. Drawing should be of a rectangle that is 1 3/8 x 3 1/16.

C. Drawing should be of a triangle that is 2 5/8 x 1 3/8 x 2 3/16.

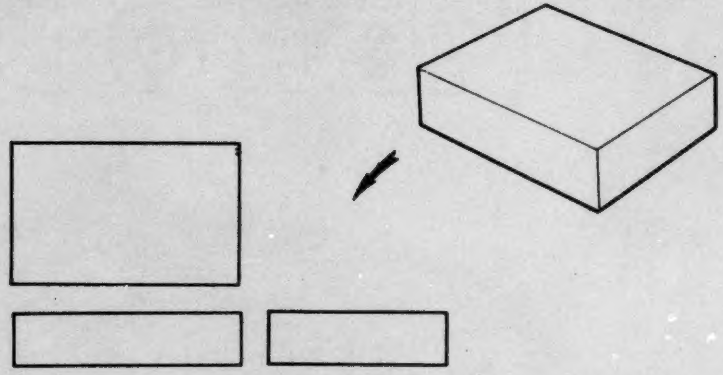
D.-F. Evaluated to the satisfaction of the instructor.

## UNIT X

## TEST

1. Explain the purpose of a drawing or blueprint.

2. Identify the three basic views of a drawing in the example below.



3. Match the terms associated with drawings to the correct definition by writing the number of each term on the right in the correct blank on the left.

___a. Numbers that show whether the part is drawn to full size, enlarged, or reduced on the blueprint.

___b. Various identification marks that are placed on blueprints to save time and convey a message to the machinist or welder.

___c. A drawing made by the machinist to show details of a part.

___d. Measurements showing the size and location of the part to be machined.

___e. The limits of measurement that the part made by a machinist must be within when completed.

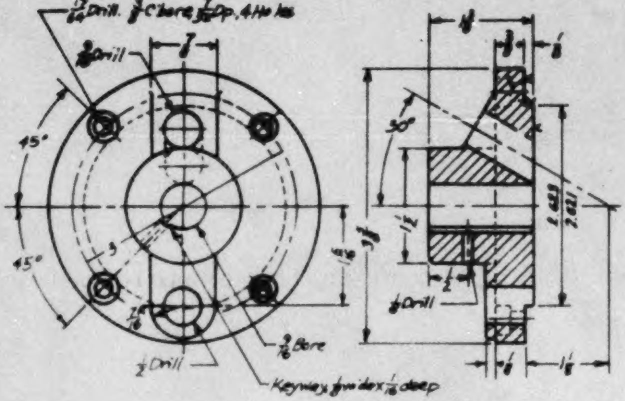
___f. Written instructions on the blueprint for the machinest containing information about the type of material, tolerances, and finish required on the part.

1. Dimension
2. Scale
3. Specifications
4. Symbols
5. Sketch
6. Tolerances

4. Identify each of the types of drawings used on blueprints by labeling each example shown below.

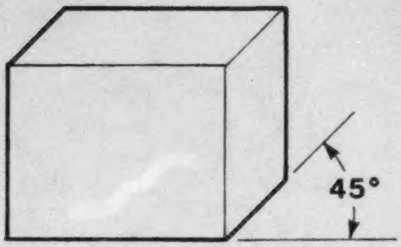
Perspective
Isometric
Oblique

Assembly
Detail

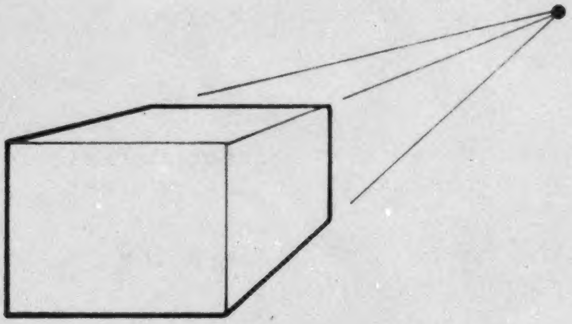


17/64 Drill, 3/8 C'bore 7/32 Dp. 4 Holes
Drill
45°
45°
30°
2.023
2.021
1/2
½ Drill
½ Drill
Bore
Keyway wide x 1/16 deep

a. ______________________

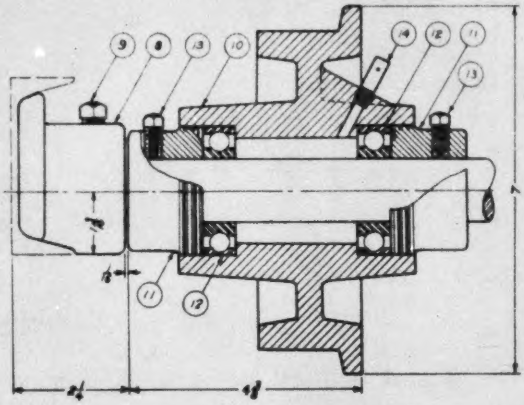


b. ______________________



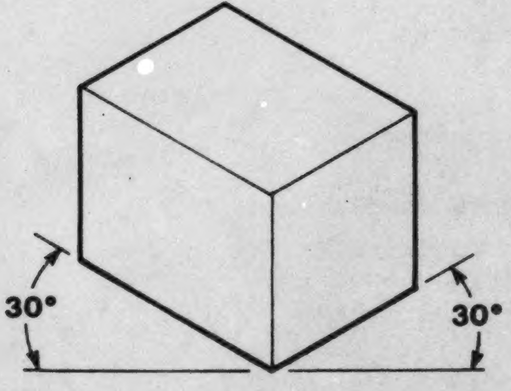
vanishing point

c. ______________________



9
8
13
10
14
12
11
13
11
12

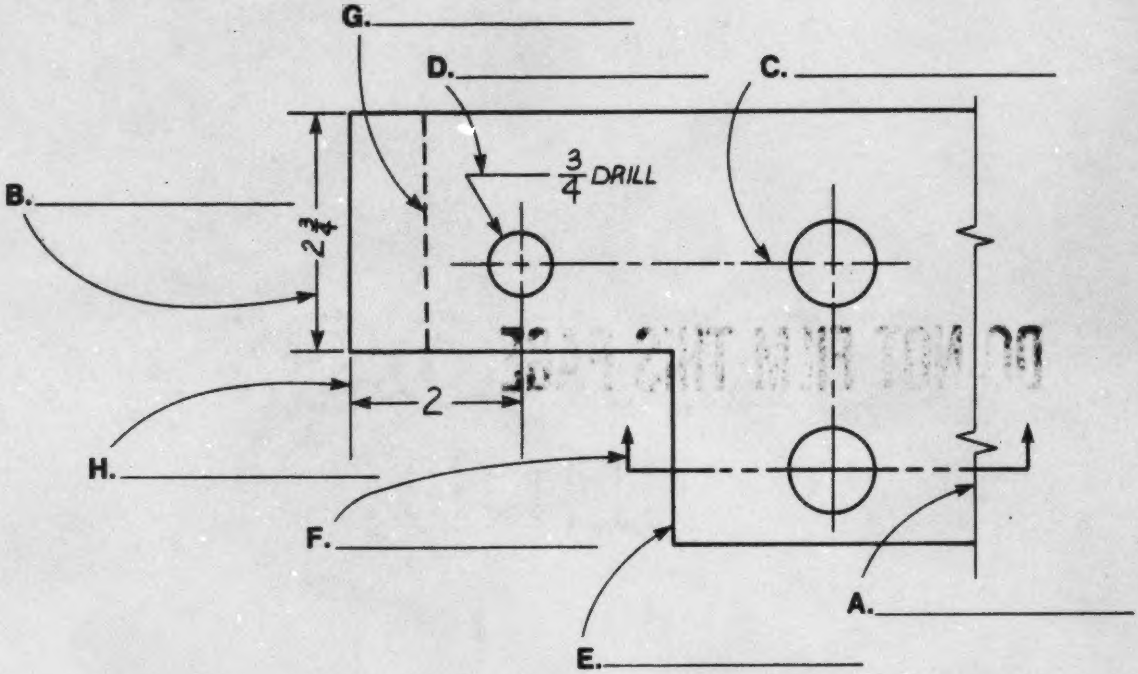
d. ______________________



e. ______________________

5. Identify each of the types of lines used on blueprints by labeling each shown in the drawing below.

| | |
|---|---|
| Leader line | Break line |
| Center line | Dimension line |
| Object line | Extension line |
| Hidden line | Cutting plane line |



6. Name the three types of scales used in drawing.

a.

b.

c.

## UNIT X

## ANSWERS TO THE TEST

1. The purpose of a drawing or blueprint is to convey a message from the designer to the workers by showing the shape and size of parts and how they fit together.

2. a. top
   b. front
   c. end

3. a. 2
   b. 4
   c. 5
   d. 1
   e. 6
   f. 3

4. a. Detail
   b. Oblique
   c. Perspective
   d. Assembly
   e. Isometric

5. a. Break line
   b. Dimension line
   c. Center line
   d. Leader line
   e. Object line
   f. Cutting plane line
   g. Hidden line
   h. Extension line

6. a. Architect's
   b. Mechanical
   c. Civil engineer's